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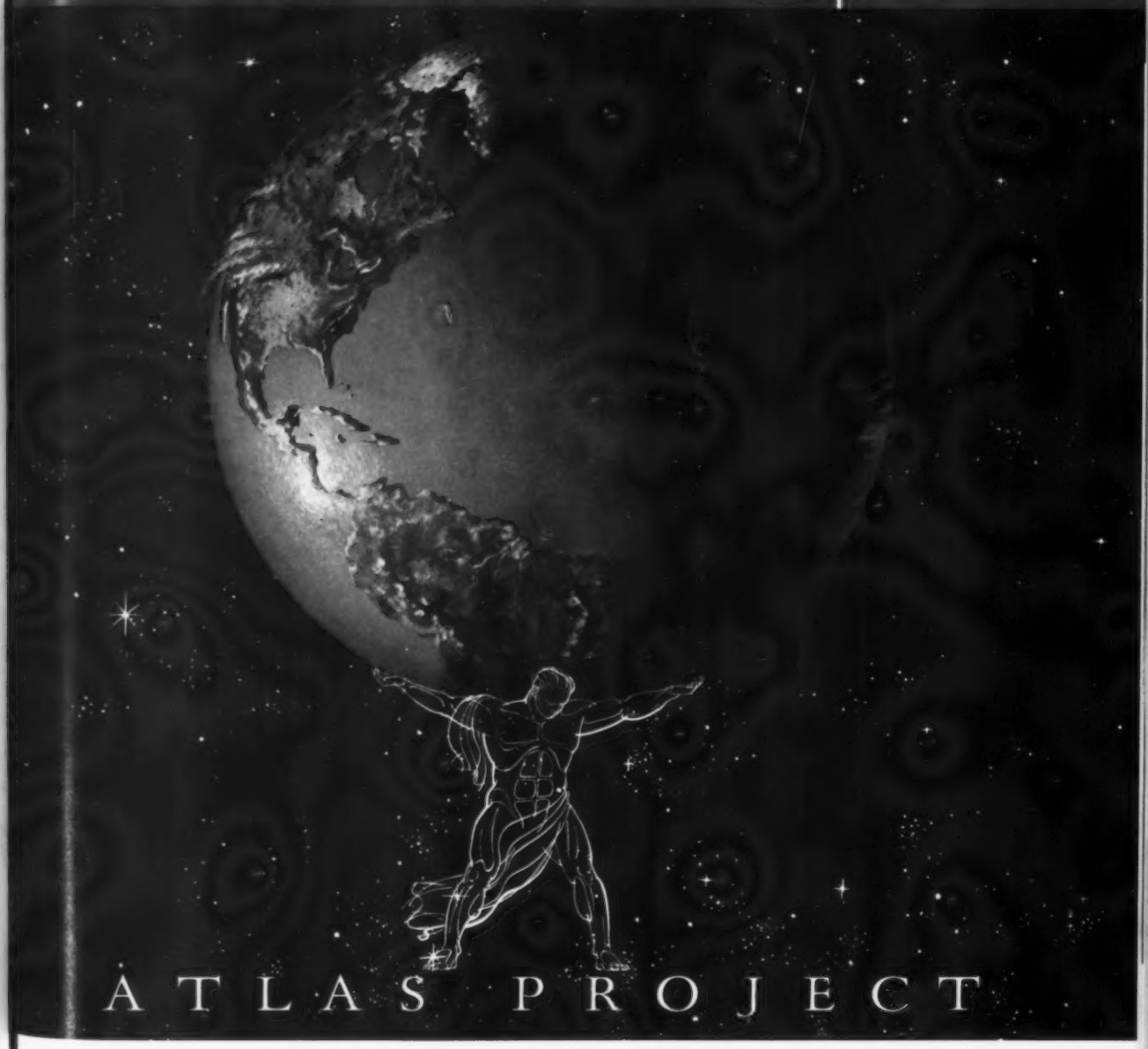

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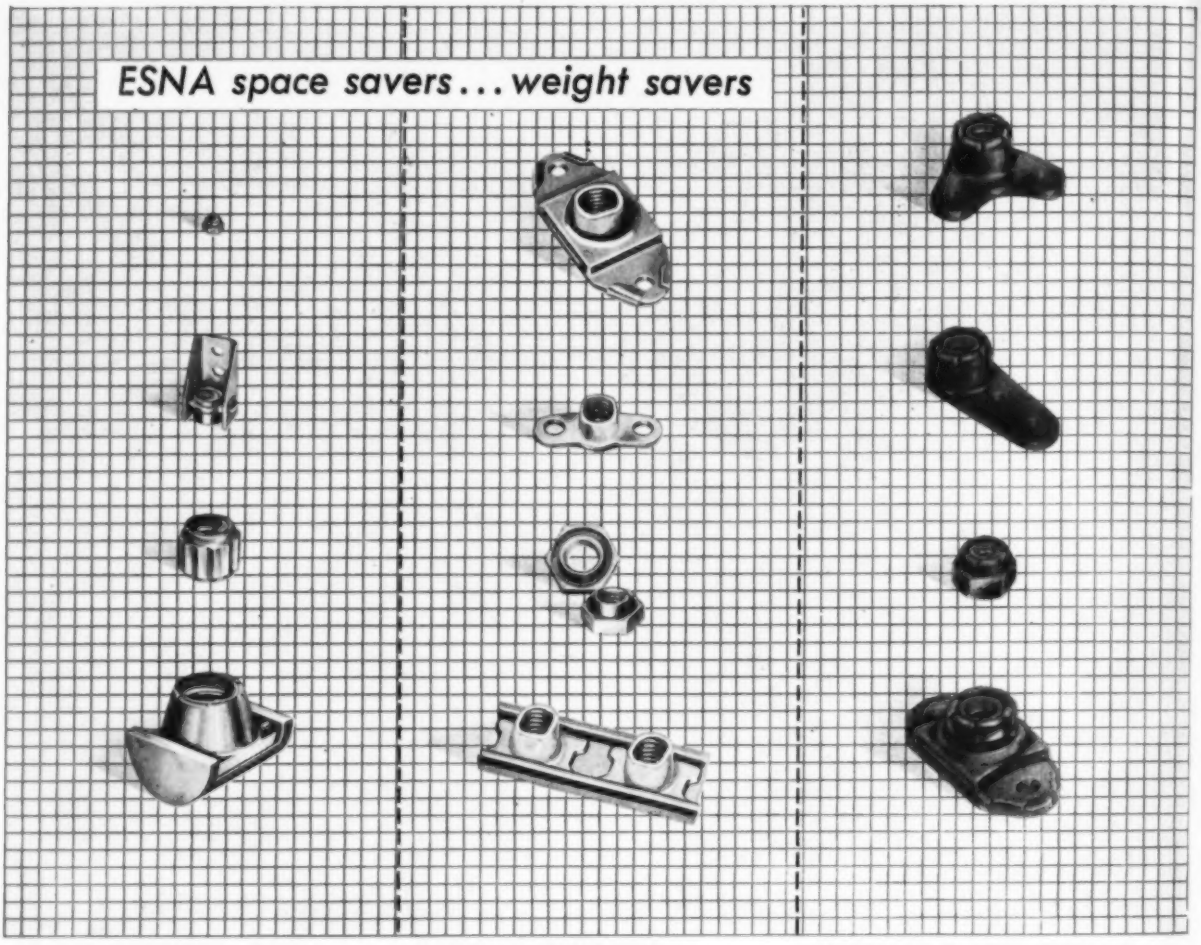

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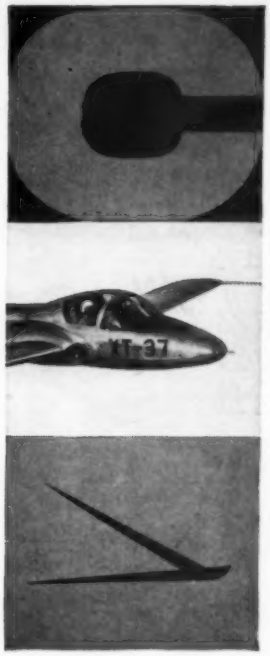

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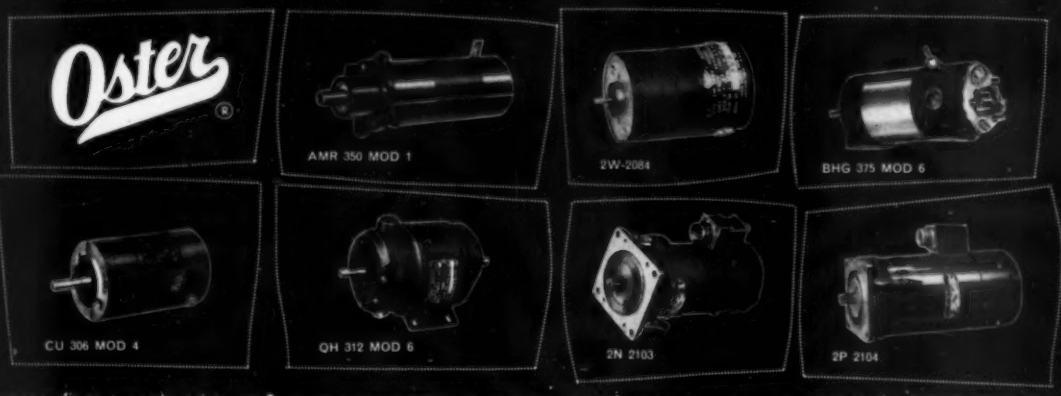

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Letters

Wifely Point of View

To the Editor:

I am the wife of an engineer in the aircraft industry and read your magazine with great interest every issue. Your 16 July "Personal View" article titled "Conflict Behind the Headlines" was better written than any I've read.

I believe if the American public better understood the problem of Air Safety more would be done about it. May I have your permission to send your article into the Editor of the *Hartford Courant*?

My husband brings home every issue of your magazine from the office and I have very much enjoyed your articles on Russia.

MRS. HAROLD E. ROBBINS, JR.
Farmington, Connecticut

Complaint

To the Editor:

I have read with a great deal of interest and amusement the article by Lois Philmus in the July 16 issue of AMERICAN AVIATION on page 74. My only comment is that I think you should acquaint Miss Philmus with the fact that PAC (Pacific Airmotive Corp.) serves more airlines, does a greater volume both in part sales and overhaul work than any other distributor in the country.

ROY BACKMAN
Vice President
Pacific Airmotive Corp.
Burbank, Calif.

(Editor's Note: Our apologies to PAC for inadvertently omitting them from a list of distributor organizations that have received airline rights.)

Likes Our Editorials

To the Editor:

You are to be complimented on your editorial regarding the Grand Canyon crash, which appeared in the July 16 issue of AA.

I have now subscribed to AMERICAN AVIATION for nearly five years and definitely consider it to be the top publication in its field. My only objection is that too little space is devoted to editorials and that fine writing like "Reckless and Irresponsible" isn't followed up enough.

I'd like to suggest that since you were successful in getting a few airplane lavatories cleaned up, you now start on the miserably filthy airport restrooms which I've found all over the country. Greater Pittsburgh is about the worst I've seen.

JAMES F. VAUGHN
1st Ltd., USAF
Mt. Laguna, California

New Business Plane?

To the Editor:

On page 25 of the July 2 issue of AMERICAN AVIATION we notice the seventh paragraph. This speaks of the pending decision by North American as to the development of a turbo prop-powered (business) plane.

We have no knowledge of the design under consideration by North American. However, the purpose of this note is to emphasize the need of improved executive flying equipment. If the design under consideration at North American does embody the essential qualifications we would hope that this company will decide to proceed with the construction of such a plane.

We would also wish to emphasize that our next ship should qualify for transoceanic world service. We believe that an increasing number of corporations are in need of such equipment. We are reluctant to outline detailed specifications although we are prepared to meet with a representative of North American to discuss details, if that company is interested.

ROBERT W. JOHNSON
Chairman of the Board
Johnson & Johnson
New Brunswick, N. J.

(Editor's Note: North American Aviation has been asked for comments. Do any other manufacturers have comments on transoceanic business aircraft?)

For the Record

To the Editor:

Your article entitled "What Lies Ahead in DME-Tacan Hassle," in the issue of July 16, attributes to me a statement to the effect that we have a military contract to develop a 1/2 ATR Tacan-compatible airborne DME.

I fully appreciate the difficulties in securing exact reporting of verbal statements on technical subjects but must point out that this alleged statement is not true and was not made by me. What I did say was that we have a military contract to build an airborne Tacan which uses no subminiature tubes and which can provide DME-only but is *not* ½ ATR), and that we have a *company* development program to produce a Tacan-compatible 1/2 ATR DME.

Your article has unfortunately led some persons to question the propriety of the military's apparent support of a commercial project and I would therefore appreciate your publishing a correction.

Incidentally, the 1/2 ATR DME referred to is expected to be working by the end of this year.

SVEN H. DODINGTON,
Director, Radio Navigation Laboratory
Federal Telecommunication Laboratories
Nutley, N. J.

News to Him

To the Editor:

I received the reprints of your article "Modern Planes Dominate Soviet Airpower" today and I want to thank you for your prompt action to my request . . . As you probably realize, much information about the Air Force is printed in magazines before it ever reaches such offices as mine. We rely on such magazines a great deal to keep ourselves up to date.

2nd Lt., USAF, ALEX CREWDSON
Information Services Officer
325th Fighter Group (AD)
McChord AFB, Wash.

Scott

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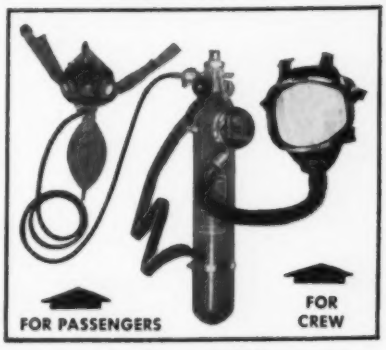

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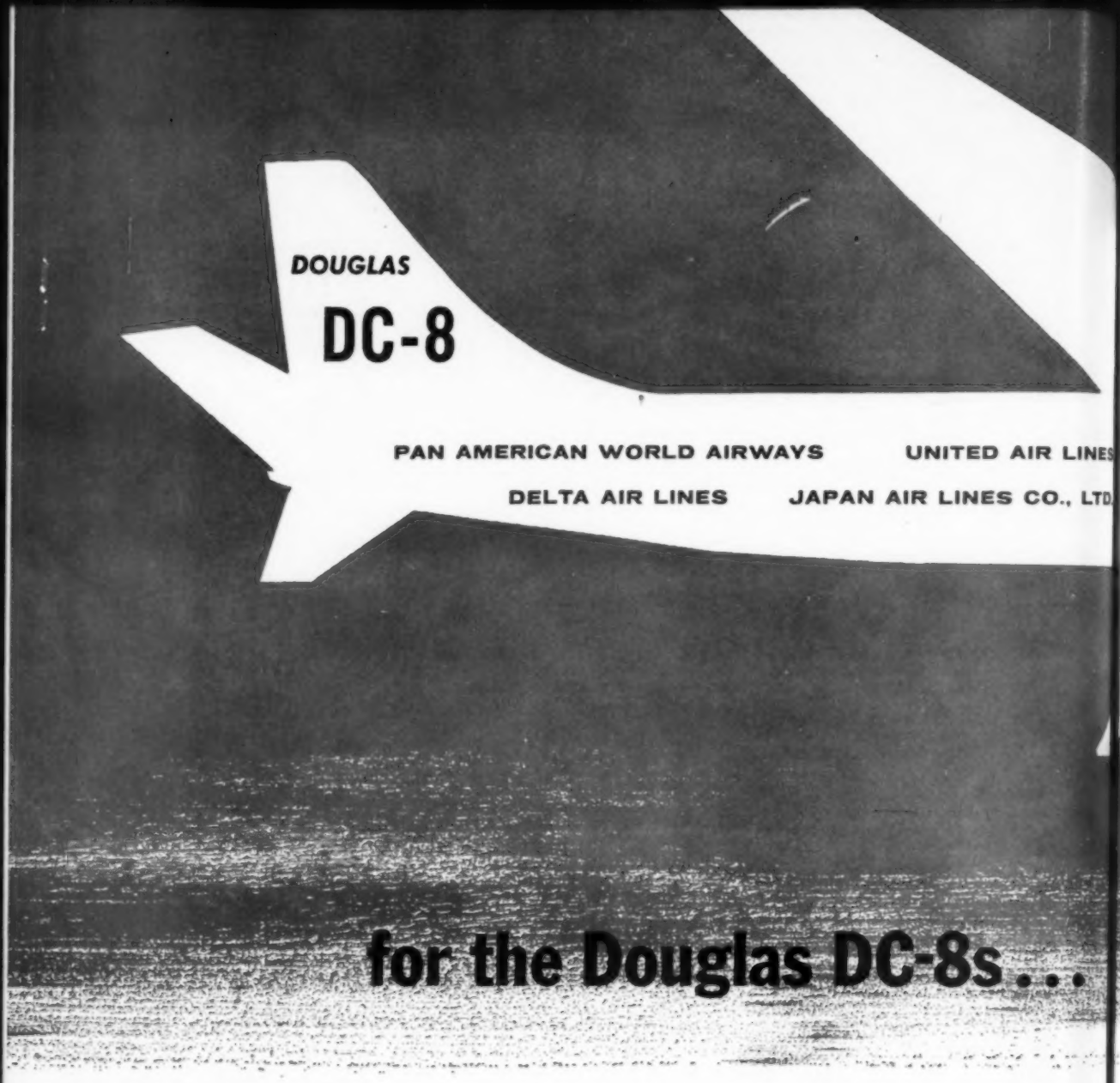
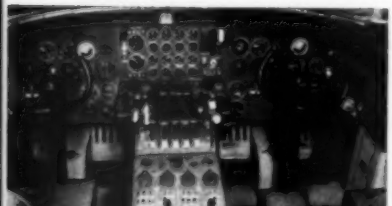


for the Douglas DC-8s . . .



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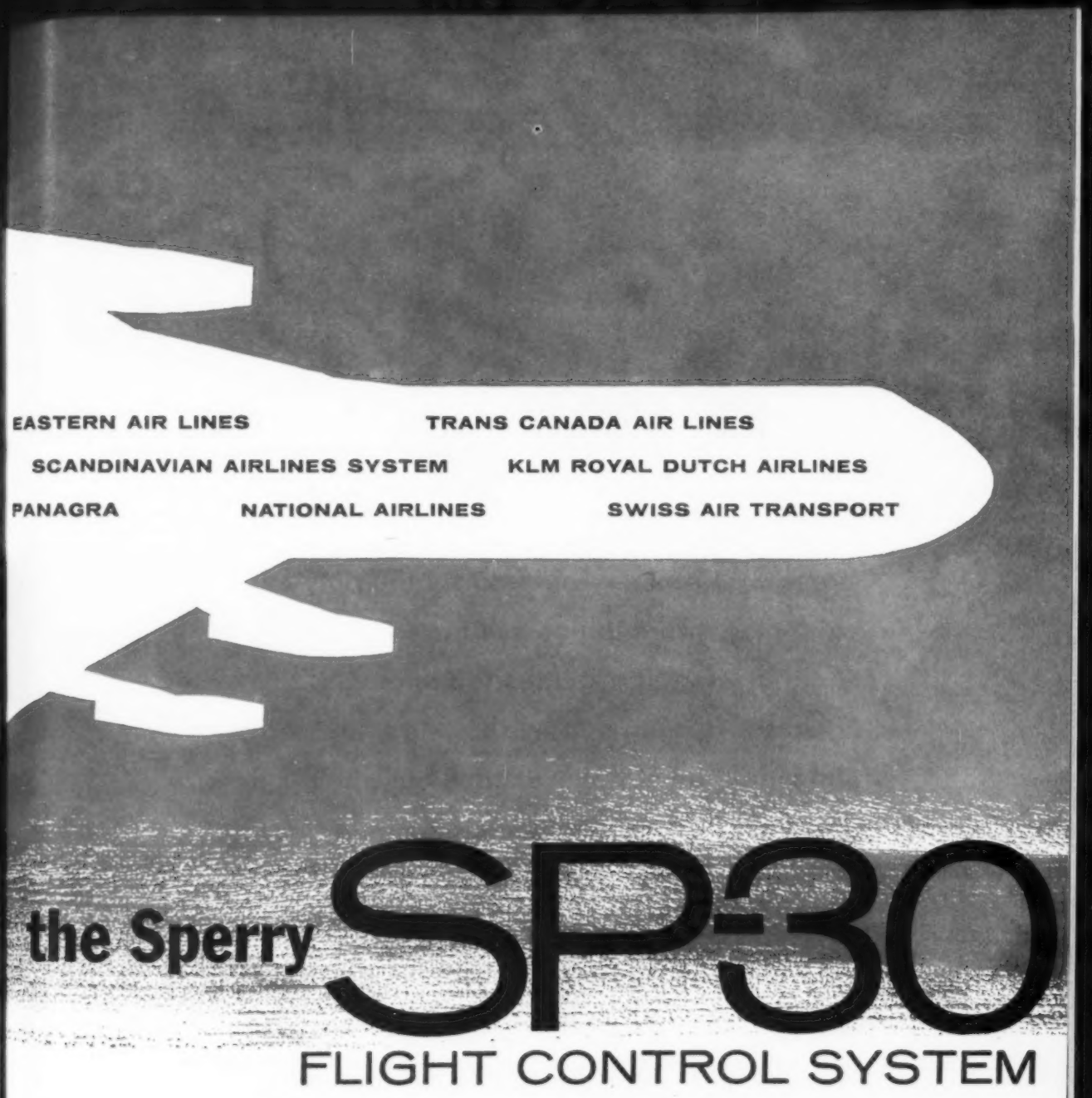

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AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL

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Personal View

By WAYNE W. PARRISH

The "New" CAB Has the Capacity

There are some encouraging signs of a constructive approach to air transport problems in the "new" Civil Aeronautics Board.

We put "new" in quotation marks because a new chairman and a new member since the first of the year have considerably altered the makeup and power balance among the five members.

Replacement of Chairman Ross Rizley by James R. Durfee seems to have been a healthy one. After a whirlwind term forced on him by the White House while he was waiting with what almost seemed desperation for the federal judgeship down in Oklahoma, Mr. Rizley left a strife-ridden agency floundering for lack of sound direction. Mr. Durfee has been a breath of fresh air. He has returned dignity to the chairmanship.

For one thing Mr. Durfee has had public utility commission experience. He didn't seek the post but could hardly refuse it when the President tendered it to him directly. He hasn't had time even to consider using it as a stepping stone to something higher.

He is taking his job seriously, not as a necessary K.P. chore. He has assumed a reasoned, cautious and rather judicial approach. He has made good impressions on industry people who have had dealings with him. He conducts meetings well. He likes conviviality after hours but he's all business in the office. In short, all of the ingredients for a praiseworthy record are there to date. All that's needed is to hold to the course.

New member G. Joseph Minetti, who switched over from the Maritime Commission to fill the Josh Lee vacancy, is much less known. He is the first New York City Democrat to serve on the Board. His questioning in oral arguments has been the most intelligent and penetrating that industry has experienced in many a year. He is unquestionably a bright and discerning attorney with a foundation of broad transportation problems.

So far Mr. Minetti has moved with extreme caution, so much so that the emphasis on stand-offish ethics by himself and staff creates a somewhat artificial and awkward atmosphere for an attorney so thoroughly trained in New York City political and civic life. He is not to be underestimated as a future power and influence on the Board but what direction he will take is anything but clear. He has the mental capacity to make a good record and it is to be hoped that this capacity is used in the best interests of public and industry. He is a man who would appear to have much ahead of him in public life.

Republican members Chan Gurney and Harmar Denny, who rarely had the support of their former Republican Chairman Rizley anyway, would not be expected to switch their basically conservative views in the future. Democrat Joseph Adams, whose term expires December 31 this year, is left without his two colleagues Rizley and Lee with whom he was often teamed in his policies of liberal dispensations.

Just what sort of political, ideological or philosophical alignment results from the new Board won't be known for awhile, but it is clear that a major change has taken place and doubtless for the good. It is certainly a more orderly, industrious Board than the hectic and acrimonious one which developed from the Rizley leadership.

There are several areas, particularly, in which CAB activities will be watched with keen interest.

One is political pressures. Chairman Durfee has already demonstrated solid and exemplary courage in this direction. For the first time since the barrier against Congressional pressures was torn down ten years ago, the new CAB has a golden opportunity to stiffen against these pressures, some of which have been close to political blackmail. The truth is that many Congressional people would like to have an "out" themselves against exerting such pressures. Chairman Durfee is not only to be commended for what he has demonstrated so far, but should be encouraged to take a continued strong stand against what everyone knows to be an evil in specific route and other cases. CAB can win this one if it wishes.

Another is economics. As an aviation publication we never express views on individual route cases. So what we have to say applies to all new route cases past, present and future. But we do know, and everyone in industry knows—regardless of applications granted, pending or proposed—that continued expansion of duplicated route patterns of the trunk carriers in areas already highly competitive will lead ultimately to economic destruction. It is not for us to say at what point there is too little or too much competition, but we would like to see the Durfee Board start digging into the economics of air transportation and take a longer look at the entire national network in the light of today's equipment and tomorrow's turbojet era. It is an extremely important problem.

A third area of interest is the local carrier system. Before much longer the CAB must decide whether it will bend to wishes of staff members to keep the local carriers forever in abject subsidized slavery or whether the locals should have the opportunity to climb out of indentured servility and become bona fide business corporations. The Board should take a long deep look at this one. And while doing so it should also ponder some of the expansion projects of the locals. Are they to become trunks themselves, or are they to provide local service for which they were certificated? The road to economic well-being does not necessarily involve endless expansion and elimination of all less productive local stops.

These are only a few of a great many pressing problems. But the Durfee Board has a greater capacity to master these problems, and is taking a more sensible approach, than has been evidenced in some years.

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The constant frequency required for optimum performance of electronic equipment in modern aircraft is now possible with a single, compact unit. The new G-E generator-drive package combines the functions of the hydraulic ball-piston constant speed drive and a statically excited generator into a integrated unit, smaller and lighter than any conventional drive and generator combination of the same rating. In addition, this new generator has all the inherent safety and performance features of the G-E Hydraulic Constant Speed Drive and the Statically Excited Generator. Please contact your nearest General Electric Aviation and Defense Industry Sales representative for complete details. General Electric Company, Schenectady 5, New York. 210-101

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All-woman transcontinental air race winners...

FIRST PLACE
Beechcraft Bonanza flown by Frances Bera; Edna Bower, co-pilot. Sponsored by AeroDuct, Incorporated.

SECOND PLACE
Pilot: Alice Roberts
Co-pilot: Iris Critchell
Sponsor: Rheem Mfg. Co.
Plane: Beechcraft Bonanza

THIRD PLACE
Pilot: Marion Craver
Co-pilot: Betty Lambert
Sponsor: Minthorne Music Co.
Plane: Piper Tri-Pacer

FOURTH PLACE
Pilot: Marian Burke
Sponsor: Burke Aviation
Plane: Piper Super Cub

FIFTH PLACE
Pilot: Irene Leverton
Co-pilot: Carol Cooper
Sponsor: Graubart Aviation
Plane: Beechcraft Bonanza

ALL SPARKED BY AC!

The 10th annual Powder Puff Derby is over . . . the gals have gone home . . . and all the records are duly recorded.

Another fact is recorded, too. *Every one of the first five winners flew a plane equipped with AC Spark Plugs!*

Every AC Spark Plug-equipped plane finished the gruelling 2,366-mile race. Four out of six leg prizes were won by gals flying planes with ACs. Of the even dozen additional prizes, AC Spark Plugs were in seven of the winning planes.

That's a record to be proud of. We think that the Powder Puff Derby has proved, once again, the extra reliability you can expect with AC Aircraft Spark Plugs.

Be sure to specify ACs in your plane.

AC short-reach plug shown: S-88. Others: HSR-86; A-88; S-86 R; SR-83 P; HSR-83 P; LA-47; SA-43; A-44.

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Circle No. 7 on Reader Service Card.

Washington Report

Missile Battle Shaping Up

Air Force dissatisfaction with Army's encroachment on its missile responsibilities is growing. AF officers make it plain they want sharper definition of missile assignments to the services than that provided by the two-year-old agreement presently controlling missile activities.

Some top Air Force leaders are particularly disgruntled with Army activities in the surface-to-air and surface-to-surface categories—specifically, the long-range Nike B antiaircraft weapon and the 1,500-mile Jupiter ballistics missile.

Legally, these sources concede, Army is within its rights in developing both weapons. The interservice agreement sets no arbitrary limit on the range of Army artillery missiles; and although it restricts the horizontal combat radius of its antiaircraft missiles to 50 miles, Army's 70-mile Nike B still meets terms of the agreement. That's because the time lag between target detection and intercept reduces its effective range to 50 miles.

AF's view is that there are a great number of areas in which Army could spend its missile appropriations without duplicating USAF efforts. For example, AF would like to see Army develop a reliable surface-to-air missile capable of picking up low-flying aerial targets, instead of tying up resources in weapons systems competitive with USAF work.

Hughes Cools on Building Jets

Early momentum behind Hughes Tool Co.'s plan to build jet transports has disappeared and the idea might even be shelved if a current reappraisal of Trans World Airlines' jet needs so dictates.

Originally, Hughes Tool and its subsidiary TWA, urged expeditious CAB action on a plan that would permit sale of the first 25 Hughes jets to TWA. CAB obliged, held a prehearing conference in July, assigned hearings for Aug. 21.

But early this month, Hughes and TWA requested indefinite postponement of further procedural steps pending further look at their jet requirements. CAB again obliged. Future developments are up to two companies. They can urge reassignment of hearings or dismissal of the whole idea.

Third Vote for ANDB?

Watch for Air Navigation Development Board to get a third voice to break up the two-vote system between Defense and Commerce Departments.

Although the Mollohan House subcommittee demurred from making any recommendations on the ultimate fate of ANDB, deadlocked almost from the outset, the suggestion of a neutral member was voiced recurrently during hearings.

No nominee was named or suggested publicly for the third vote, but Special Presidential Aide Edward P. Curtis is looked upon as the obvious candidate.

Efforts to get a third voice on ANDB certainly will be pushed by industry, as an interim measure at least.

What, No Politics?

Capitol Hill aviation and political writers raised their eyebrows over decision of Sen. Stuart Symington (D-Mo.) to withhold the report on his Airpower Subcommittee's hearings until after the November election to avoid involving its findings and recommendations in election-year politics.

What, the reporters ask, does the senator think has been happening to his hearings during the spring and summer?

Tacan - DME Mandate

Commerce and Defense Departments have a mandate from a House Government Operations subcommittee (Mollohan) to resolve the Tacan-DME controversy "no later than October 1."

Subcommittee said there was little excuse for further procrastination on the dispute. The group added that the vacillation on reaching a decision is "symptomatic of the lack of planning and direction in aviation matters within the federal government."

Prospects: Controversy will continue until White House makes the decision.

State's New Aviation Leader

Look for increased attention to aviation problems in State Department's Office of Transport and Communications as outgrowth of recent staff changes.

Reason: Livingston Satterthwaite, named temporary successor to J. Paul Barringer as head of the office, is a former U.S. civil air attaché in London and recently headed U.S. air talks with India, Britain and France.

Although Satterthwaite ranks too high to hold the post permanently, the industry can look for a revitalized approach to aviation matters, one that should carry on to his ultimate successor.

Of equal significance is advancement of Henry T. Snowdon to head the office's aviation division. He has a solid background of airline experience. Snowdon succeeds Edward A. Bolster, who will attend the War College starting this month.

Labor's Ideas on Stability

Labor has come up with its own proposals to the military and management for stabilizing employment in the aircraft industry.

IAM President A. J. Hayes says these specific activities would develop an adequate, stable work force:

1. A program of national airpower predicated upon the continuing threat of Communism to our way of life, instead of upon the ebbs and flows of cold war.

2. A research and development program that covers every phase of military and civil aircraft.

3. An industry plan, developed jointly by labor and management, and perhaps government, to maintain a stable work force, including the possibility of offsetting temporary fluctuations in manpower needs by a fluctuating schedule of weekly hours.

Bendix BRAKES WITH CERAMETALIX*

Here is an unbeatable combination—the Bendix Segmented Rotor Brake and Cerametalix† brake lining.

These two were made for each other—literally! For Cerametalix lining was developed by Bendix for use in Bendix† brakes; then, the brake itself was proportioned to take full advantage of this remarkable new kind of friction material.

NO FADE. The result is a brake that will not fade, fuse or lose friction, even under braking loads that heat the linings to incandescent temperatures!

LESS MAINTENANCE. Also, less time and expense are required for maintenance because adjustments are less frequent and linings last several times longer.

NO WARPING. The lining material itself is a good conductor of heat. This, combined with the exclusive Bendix segmented rotor construction, eliminates warping and welding of friction surfaces.

It all adds up to a new high in brake performance that meets the challenge of stopping increasingly faster and heavier airplanes with a brake "package" of necessarily limited size . . . a brake that, even under the toughest conditions, can be depended upon from touchdown to the end of the landing run!

*CERAMETALIX Bendix brake stator faced with Cerametalix—an entirely different kind of friction material. Cerametalix is a sintered compound of ceramic and metallic ingredients that has amazing resistance to heat and wear. As a result, friction loading and energy absorbing capacity can be approximately doubled.

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Production Spotlight

• Air Force is test-firing the Hughes Falcon air-to-air missile and the Bell Rascal air-to-surface missile at Holloman AFB, N. M., and the Boeing Bomarc ground-to-air vehicle at its Cape Canaveral, Fla., test center.

• USAF finally has admited the Boeing Bomarc is powered by two ramjets (Marquardt RJ43s) with rocket boost.

• The Comet 3 will be modified to incorporate most of the features of the Comet 4 and 4A. Detachable wingtips will permit evaluation of both the 4 and 4A wing shapes.

• Convair is keeping one of its YF2Y-1 Sea Darts active in a hydromatic research program being conducted for Navy at San Diego. Other Sea Darts have been placed in storage. Delta-wing jet seaplane makes good test vehicle for evaluation of water ski configurations and it is economical since no additional supporting equipment or facilities are required.

• Australia's Commonwealth Aircraft Factory probably will produce the Lockheed F-104A under license, using the GE J79 engine. (Australians suffered a delay of more than a year when they re-engined the license-built NAA F-86 with the Rolls-Royce Avon).

• Civil RA 29 version of the Rolls-Royce Avon turbojet features hot-air de-icing of the first row stator blades for letdowns in icing conditions at reduced power.

• Blackburn & General Aircraft is developing a jet starter from its license-built Turbomeca Palouste air compressor. A Palouste recently completed an unofficial 150-hr. type test.

• Shin Mitsubishi has started pilot production of Japan's first air-to-air guided missile, the MM-1. The 45-lb. missile uses a guidance system built by Mitsubishi Electric Co. and a rocket motor manufactured by Fuji Precision Machinery Co.

• Germany's Borgward company, a leading automobile manufacturer, has hired helicopter expert Professor Focke and is entering the rotorcraft field. Bremen-based firm will build original German designs rather than foreign types under license.

• Glenn L. Martin Co. has ordered a Convair 440 executive transport which probably will succeed company's present converted Martin-liner.

• Direct view bright trace storage tubes soon will be aiding visibility of airborne weather-mapping radar displays under daylight cockpit conditions. RCA has finalized its tube design for production, expects to have complete indicator unit for airline use next January. Farnsworth and Hughes tube designs, still in a state of flux, probably will be finalized now that a competitor already has shown his product.

• Colorado Springs will be the central point for all information from the SAGE system. Simultaneous with such transmission to the central point will be notification of all other interested activities, such as Strategic Air Command, Tactical Air Command, antiaircraft missile units, CD headquarters etc. System is expected to be completed in three years.

• Ryan's XQ-2B version of the Firebee will be near-sonic and fly up to 50,000 ft. Present Firebees hit 600 mph and altitudes up to 40,000 ft.

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adds positive level control to any fuel gage

Avien . . . pioneer in the development of aircraft fuel management systems . . . now brings dependable fuel level control to any fuel gage installation.

Employing Avien's service-proven thermistor switch in a new clamp-on design, the "piggy-back" sensor mounts on any tank probe — provides precise level signals for high- or low-limit warning, tank sequencing and other fuel management jobs. External relay unit eliminates moving parts from the tank, assures reliable control of signal lights, pumps or valves.

Weighing less than 0.5 pound, the "piggy-back" Thervel Switch uses only three wires between units; is adaptable to any fuel system without altering present equipment.

Most important — operation is independent of fuel gage circuits, providing positive level monitoring even under emergency conditions.

Additional features:

- **Operates from standard 28 volt DC supply**
- **Unaffected by slosh, vibration or acceleration**
- **Requires no additional mounting holes**
- **Conforms to MIL-E-5272A and MIL-G-9815 (ASG)**

Other Models: Available in 12 volt and bracket-mounted models, as well as special designs.

For complete specifications and application data write Dept. AA-8

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Industry News Digest

Missiles Will Get 30-90% of All AF Missions, Gen. Lindsay Predicts

Guided missiles will ultimately take over 30% of the missions of the USAF Tactical Air Command, half of the targets of the Strategic Air Command and up to 90% of the missions of the Air Defense Command, according to Maj. Gen. Richard C. Lindsay, Director of Plans for the Air Force.

His prediction came in a major presentation at the Guided Missiles Conference held by the Air Force Association in New Orleans. Although the proportion of missiles to manned aircraft will rise steadily, he said, USAF missions for the foreseeable future will best be performed by a "mixed force" of aircraft and missiles.

"It appears that we can best use guided missiles to destroy large or area targets, while aircraft would be used to destroy pinpoint targets and targets whose exact geographical coordinates are not known," he said.

• **"A look at** the technical estimates of the surface-to-surface missile's future capability in relation to manned aircraft and the targets to be attacked indicates that 50% of the Strategic Air Command's mission could sometime be accomplished with guided missiles . . . (but) . . . it appears that only about 30% of the tactical targets would probably be suitable for attack by guided missiles," Lindsay said.

If surface-to-air missiles continue to develop as expected, he said, "we visualize that in air defense they may be capable of taking over a greater percentage of the job than in any of the other areas." He revealed a chart indicating this might rise as high as 90%.

• **The USAF plans chief** also disclosed some of the provisions of the heretofore classified "Assignment of Responsibilities for Guided Missiles" which was worked out two years ago by the Joint Chiefs of Staff to fill in gaps in earlier interservice agreements on roles and missions. The Air Force insists this agreement should be revised, particularly in the area of surface-to-air and surface-to-surface weapons which the Army is developing in competition with USAF projects.

Lindsay said the agreement gives the USAF responsibility for surface-to-air missiles "which are designed to destroy enemy aircraft beyond a horizontal range of 50 miles," leaving the Army to spot-defense missiles of less range. The line of demarcation is not as clear in the surface-to-surface area, he said. The paper gives the USAF responsibility for tactical interdiction and strategic weapons, but leaves the Army with responsibility for developing and using such missiles as necessary to conduct its conventional artillery functions, apparently with no limit on range.

• **Meantime, 15 major contractors** engaged in the development of the Atlas, Titan and Thor ballistic missiles were officially disclosed by Brig. Gen. Don R. Ostrander, assistant commander of the Air Research and Development Command for guided missiles.

Nose cone: General Electric Co., Special Projects Dept., at Philadelphia; AVCO Mfg. Corp., Stratford, Conn., and Missile Systems Div., Lockheed Aircraft Corp.

Guidance: GE, Heavy Military Electronics Div., Syracuse, N. Y.; Bell Telephone Laboratories, Western Electric Co., Whippany, N. J.; American Bosch Arma Corp., Garden City, N. Y.; A. C. Spark Plug Div. of General Motors Corp., Milwaukee; Burroughs Corp., Paoli, Pa., and Univac Div., Sperry-Rand Corp., St. Paul, Minn. (A seventh contractor, the Instrumentation Laboratory of Massachusetts Institute of Technology, was inadvertently omitted from the USAF's compilation.)

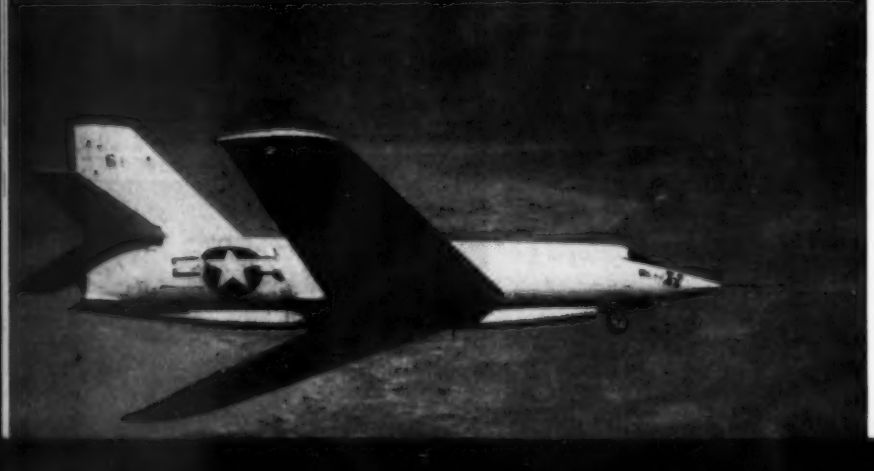
Airframe: Convair Div., General Dynamics Corp., Atlas; The Martin Co., Denver, Titan, and Douglas Aircraft Co., Inc., Thor.

Propulsion: North American Aviation, Inc., Rocketdyne Div., Canoga Park, Calif., Atlas; Aerojet-General Corp., Sacramento, Calif., Titan, and American Machine & Foundry Co., Pacoima, Calif., auxiliary power units for the three missiles.

• **Three new missile testbeds** were disclosed at the New Orleans conference. They were the Lockheed X-7, a ramjet-powered missile launched from an aircraft and recovered by parachute, the Lockheed X-17, a three-stage rocket designed to test ballistic missile nose cones by firing them at terrific speeds from the ionosphere to the earth, and the North American X-10, a supersonic vehicle powered by two J57 engines which is designed to gather data on NAA's ramjet-powered Navaho. ◆◆◆

Bell X-2 Tops 1,900 mph

Bell Aircraft's X-2 stainless steel research plane has topped 1,900 mph. Exact speed is under security wraps. Lt. Col. Frank K. Everest, Jr., was at controls. X-2 is powered by a Wright XLR-25 throttleable rocket and is designed for speeds above Mach 3. Photo shows aircraft preparing to land following test.



Carl Hinshaw Dies

Rep. Carl Hinshaw (R-Calif.), 62, for more than 16 years an aviation policy leader in the House of Representatives and one of airpower's staunchest supporters, died in Washington last week.

Hinshaw was a member of a House committee to investigate air accidents in 1940-42; vice chairman of the Congressional Air Policy Board in 1946; and had served as chairman of a subcommittee on combat aviation and congressional adviser to U.S. delegation to ICAO commission on multilateral agreements. He was second ranking member of House Committee on Interstate and Foreign Commerce.

He received the Air Force Assn. Citation of Honor in 1948, the NAA Wright Brothers Memorial Trophy in 1953. At time of his death he was president of Aero Club of California.

Gnat Prototype Crashes

Prototype of the Folland Gnat, new lightweight fighter now in limited production for the British government, crashed on July 31. Pilot of the flight was E. A. Tennant, Folland's chief test pilot, who ejected himself safely using the Gnat's lightweight (47 lb.) cockpit ejection seat.

Curtis Names Team To Develop ATC Plan

Special Presidential Assistant Edward P. Curtis has named an eight-man systems engineering team to develop a master plan for the air traffic control system of the future.

The group, under temporary chairman Preston Bassett, retired v.p. of Sperry Rand Corp., is on a six-month assignment and has already been put to work, Curtis said. Plan is to hold regular seminars between the team and airspace users at regular intervals as their work progresses.

Serving with Bassett are: Gordon Dewey, operations research and systems analyst; Dr. Ralph Johnson, Ramo-Wooldridge Corp; Lloyd Perper, consulting engineer; Dr. Ralph Queal, Wright Air Development Center; Norman Smith, Melpar, Inc.; Michael Witunski, Univ. of St. Louis; and, Dr. Samuel Alexander, Bureau of Labor Standards.

Bristol Reveals Details On Thor Ramjet

Bristol Engines' Thor ramjet, which is intended to power a Bristol Aircraft long-range ground-to-air missile and has been under development for over six years, was unveiled this month. More than 200 have been fired, presumably in test vehicles.

The Thor develops a thrust at high altitude equal to 90,000 hp at sea level, and is said to be a Mach 3 engine. Diameter is 15.65 in. and length 102 in.

Thor was developed from the Boeing Bomarc's Marquardt RJ43 ramjet but does not resemble it. Bristol asserts that the Thor's fuel system is better than that of any ramjet in the U.S. Starting reliability is given as 100%. Thor is described as "highly expendable." It is a welded stainless sheet steel engine.

At least two Thor models exist—the BT1 and BT2. The description here applies to the BT1. Other Bristol ramjets are designated BRJ2 and BRJ4.

Douglas DC-6/7 Deliveries Total 700

Douglas Aircraft Co. is preparing the 700th plane in its DC-6/7 series for delivery. It is a DC-7B for Eastern Air Lines now on the flight line at Santa Monica.

The 700 figure includes both commercial and military models of the Douglas transport. All military orders have been completed and full production—currently 10 planes a month—is devoted to fulfillment of commercial orders. Rate of production is being stepped up gradually and will be at 15 a month by spring of 1957.

Before the DC-6/7 line shuts down in 1958—if it really does shut down at that time—Douglas will pass the 1,000 mark in the sale of postwar, four-engine pressurized transports. It only has to sell six more planes to reach this goal since its present backlog of DC-6A, DC-6B, DC-7, DC-7B and DC-7C orders from airlines totals 294.

NB-36H—Convair's A-Plane Testbed

First photo of NB-36H, nuclear reactor testbed being used by Convair-Ft. Worth in A-plane research, shows modified bomber on high-altitude test flight. Low-powered "hot" reactor does not power NB-36H, but is used to determine effects of radiation on airborne equipment, to evaluate methods of crew shielding, and to test nuclear instrumentation. Fuselage air-scoops aft of wing cool the reactor when operating.

CAA Official Says There Were No ATC Violations in Grand Canyon Collision

Prospects loom stronger than ever that the nation's worst air disaster may go into the record as an entirely "legal" event under today's air traffic control rules.

And equally as strong is the possibility that Civil Aeronautics Board investigators may never pin down exactly what caused the June 30 collision of a United Air Lines' DC-7 and Trans World Airlines' 1049A Super Constellation over Grand Canyon.

Both situations became increasingly evident as some 35 witnesses testified in Washington recently before a six-man fact finding panel that included CAB Chairman James R. Durfee and Board member G. Joseph Minetti. Even the appearance of unexpected eyewitnesses, a vacationing couple from Ottawa, Ohio, and another from Clarksburg, W. Va., failed to supply new evidence.

300 Million Passengers

U.S. scheduled airlines carried their 300,000,000th passenger on July 29, according to estimates based on CAA figures. It took the carriers 24 years to reach the 100,000,000 mark in 1950. The 200,000,000th passenger was carried only four years later, and the 300,000,000th just over two years later.

• **Key testimony** on the ATC aspects of the accident came from D. D. Thomas, who directs CAA's recently-formed Office of Air Traffic Control. From an ATC standpoint, Thomas said, the handling of the flights involved no violation of Civil Air Regulations, or any other regulations.

Detailed questioning of the individual controllers from Los Angeles, Albuquerque and Salt Lake City Air Route Traffic Control Centers bore out Thomas' testimony. From the time the UAL aircraft left Palm Springs, Calif., and TWA passed over Daggett, Calif., both flights were operating outside of controlled airspace and beyond the limits of CAA responsibility for air traffic separation.

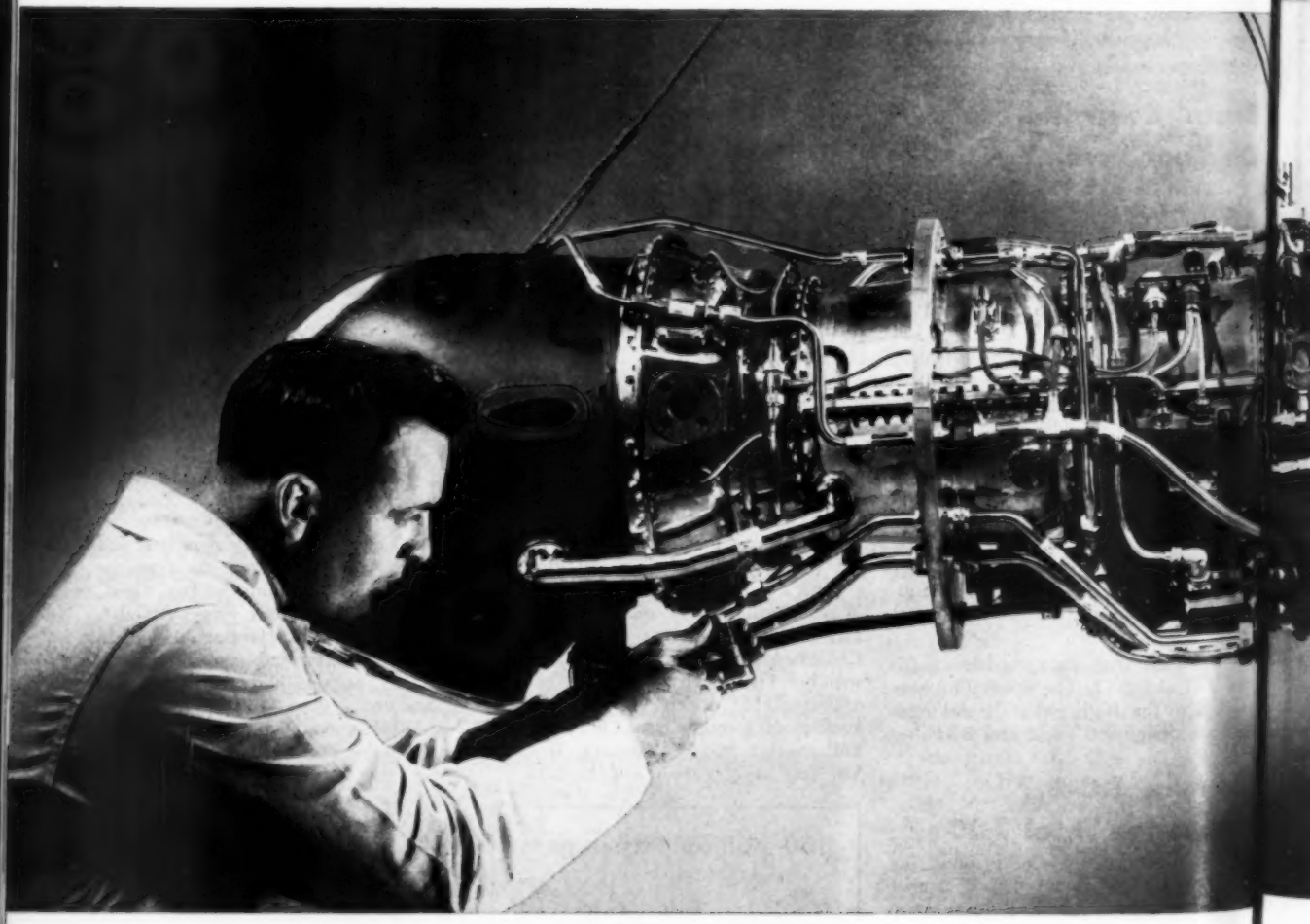
When subsequently asked why the relatively densely traveled route on which the aircraft were operating was not controlled airspace (a federal airway), Thomas traced this to shortage of funds, personnel and equipment. He noted, however, the prospects are looking better for all three.

• **Most conclusive information** on weather in the accident area was produced by American Airlines' pilot Lionel Stephen, who flew a radar-equipped National Airlines' DC-6 over Grand Canyon Airport at 11:39 a.m., only eight minutes after the estimated collision time.

(*Continued on page* 23)

General Electric's New

WEIGHS 250 LBS



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T58 Turboshaft Engine

DELIVERS 1050 HP

specific fuel consumption — 0.67 normal
specific engine weight — 0.24 lb/hp
overall engine length — 55 inches
diameter at maximum flange — 16 inches

General Electric's T58 turboshaft engine is "power in a small package." Power for helicopters, convertiplanes, and tomorrow's small aircraft.

With a power-weight ratio of more than four to one—fuel consumption rivalling a reciprocating engine's—the T58 introduces an era of outstanding small aircraft performance and operating economy.

New standards of speed, range, and payload will follow the T58 wherever it flies. Easy maintenance, long operating life, installation flexibility—these, too, are inherent by-products of the T58's advanced design.

The T58 was designed and developed for the U.S. Navy by General Electric's Small Aircraft Engine Department in Lynn, Mass. It is further evidence of G.E.'s skill and experience in the art of aircraft gas turbine design.

Find out what the T58's many features can mean to your aircraft. Call your General Electric Aviation & Defense Industries Sales Office or write: General Electric Company, Section 233-2, Schenectady, N. Y., for the T58 descriptive bulletin.

All figures are based on engine without helicopter reduction gear. Gear weight: 75 lbs.

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When & Where

AUGUST

Aug. 15-17—IAS National Turbine-powered Air Transportation Meeting, Grant Hotel, San Diego, Calif.

Aug. 20-21—National Telemetering Conference sponsored by IRE, AIEE, IAS and ISA, Biltmore Hotel, Los Angeles.

Aug. 21-24—Western Electronics Show and Convention, sponsored by IRE and West Coast Electronic Mfrs. Assn., Pan-Pacific Auditorium, Los Angeles.

Aug. 22-24—Bendix Scintilla Int'l Ignition conference, Sidney, N. Y.

Aug. 27-29—Association for Computing Machinery national meeting, University of California, Los Angeles.

SEPTEMBER

Sept. 1-3—1956 National Aircraft Show, Will Rogers Field, Oklahoma City.

Sept. 3-9—Society of British Aircraft Constructors exhibition and flying display, Farnborough, England.

Sept. 6—Sixth annual Airwork-Pratt & Whitney Aircraft engine operation and maintenance forum, Millville, N. J.

Sept. 9-11—International Northwest Aviation Council convention, Boise, Ida.

Sept. 10—Pratt & Whitney-Southwest Airmotive Co. engine forum, Melrose Hotel, Dallas.

Sept. 13—Airwork-Pratt & Whitney Aircraft engine operation and maintenance forum, Miami, Fla.

Sept. 14-15—Conference on Communications, Roosevelt Hotel, Cedar Rapids, Iowa.

Sept. 17-21—Annual general meeting International Air Transport Assn., Edinburgh, Scotland.

Sept. 18—Third Air Navigation Conference, Montreal.

Sept. 24-26—American Rocket Society fall meeting, Hotel Statler, Buffalo, N. Y.

Sept. 25-29—International Association of Aircraft Constructors jet transport conference, The Hague.

Sept. 29—USAF Class 41-G reunion, Officers Club, Bolling AFB, D. C.

OCTOBER

Oct. 1-3—National Association of State Aviation Officials annual meeting, Lake Placid, N. Y.

Oct. 1-3—National electronics conference and exhibition sponsored by AIEE, IRE, Illinois Institute of Technology, Northwestern University and University of Illinois, Hotel Sherman, Chicago.

Oct. 2-4—1956 Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Secor Hotel, Toledo, Ohio.

Oct. 2-6—SAE National Aeronautical Meeting, Aircraft Production Forum and Engineering Display, Hotel Statler, Los Angeles.

Oct. 3-5—Seventh annual National Airports Conference, University of Oklahoma, Norman, Okla.

Oct. 7-9—American Helicopter Society western forum, Adolphus Hotel, Dallas.

Oct. 8-10—Second annual symposium on aeronautical communications sponsored by IRE, Hotel Utica, Utica, N.Y.

Oct. 10-12—SAE National Transportation Meeting, Hotel New Yorker, New York.

Oct. 13-20—Eighth Annual All-Texas Air Tour, headquarters Walton Bldg., Austin, Tex.

Oct. 23-25—National Business Aircraft Association 9th annual meeting and forum, Miami, Fla.

Oct. 25-26—Aircraft Electrical Society annual display of electrical equipment, Pan-Pacific Auditorium, Los Angeles.

Oct. 29-30—Third annual East Coast Conference on Aeronautical and Navigational Electronics, sponsored by IRE, 5th Regiment Armory, Baltimore.

NOVEMBER

Nov. 1-3—National Aviation Trades Association annual convention, St. Louis.

Nov. 8-9—SAE national fuels and lubricants meeting, Mayo Hotel, Tulsa, Okla.

Nov. 14-15—Aircraft Industries Association export conference, Miami Beach, Fla.

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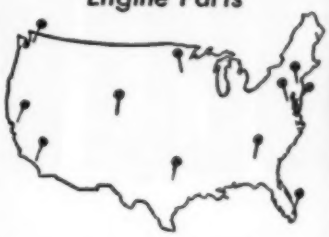

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Municipal Airport, Millville, N. J.
Branches at:
Airport, Newark, N. J.
814 N. Main St., College Park, Ga.
5245 Northwest 36th St., Miami, Fla.
5821 Seminary Road, Bailey's Crossroads, Alexandria, Va.

Pratt & Whitney Aircraft

Division of United Aircraft Corporation
East Hartford, Connecticut

Industry News Digest

(*Continued from page* 19)

Stephen said he observed one billowing cumulus formation building up to an estimated altitude of 25,000 ft. and placed its location about 25 miles west of Grand Canyon village. A CAB map exhibited at the hearing identifies the crash site as east of the cloud build-up reported by Stephen.

First clues as to just how the two aircraft collided came from CAB engineer Martyn V. Clarke who headed a 14-man structures investigating group at the crash site. It was this group that officially confirmed that the two aircraft actually collided.

And although investigators are still studying wreckage in an attempt to determine the exact inflight impact sequence, Clarke reported these findings to date:

- The left outer wing of the UAL DC-7 and the aft fuselage of the 1049 just forward of the empennage made contact.
- A propeller or propellers of the DC-7 inflicted one or more cuts in the 1049 fuselage.
- Fuselage of the 1049 forward of the wing was also involved in inflight contact.

Clarke testified that the Constellation empennage was found about 550 yards from the main wreckage with evidence that both empennage and tail cone separated from the aircraft before ground impact and probably very soon after the inflight collision.

- **Several pieces** of DC-7 structure, all identified as parts of the left outer wing, were found at or in the vicinity of the 1049 wreckage. One section of lower wing skin was found to contain a small piece of cabin interior headlining material and traces of a brownish substance used to seal 1049 fuselage seams and stringers.

At the DC-7 crash location, investigators noted an almost complete lack of gasoline in the impact area of the left wing. This fact, along with the finding of portions of the outer wing in the 1049 impact area, gave rise to the supposition among CAB investigators that the left wing sustained major damage in flight and was drained of fuel from its outer tanks before ground contact. ◈◈◈

Convair Boosts Landing Weight of Model 880

Convair has increased the landing weight of the Model 880 jet transport from 123,500 to 130,000 lbs. Reason is to increase reserve fuel for long-range flights. With the zero fuel weight remaining at 110,000 lbs., the higher landing weight will allow for 20,000 lbs. of reserve fuel, or enough for three hours holding at 5,000 ft.

Convair reports the new landing weight is being accomplished with very little increase in empty weight except for 75 lbs. for heavier brakes. No structural beefup is required.

SAC Negotiates New Jet Overhaul Contract

Southwest Airmotive is now in negotiation with the Air Force for its second annual jet engine overhaul contract. Present contract, which has another month to run, was the first ever awarded to a civil overhaul base.

The new contract is expected to call for overhauling about 1,500 engines in an 11-month period or seven engines per day. Initial contract was for $3 million to overhaul more than 1,200 engines and terms are expected to be about the same.

SAC experienced its peak period July 16-31 when it ran 135 engines through its test cell, J. E. Lockhart, Jr., vice president-service, told AMERICAN AVIATION. By running both cells, he estimated, 500 engines a month could be pushed through.

News Briefs

MANUFACTURING—MILITARY

- **Donald W. Douglas,** president of Douglas Aircraft, will receive 7th annual National Defense Transportation Association Award as "the person who has made the most outstanding contribution to military transportation in the preceding year." Award will be made at NDTA's annual dinner in Salt Lake City on Oct. 17.
- **Boeing Airplane Co.** and N. W. Ayer & Son advertising agency will part company by "mutual agreement." Reason given was conflict of interest arising when United Air Lines, an older Ayer account than Boeing, ordered DC-8s instead of Boeing 707s. Ayer has been Boeing's agency since 1942.
- **Temco Aircraft Corp.** has added Fred Grisak, nuclear specialist, to its engineering staff to write a report on the nuclear field "to determine where Temco may develop a nuclear capability." Grisak was formerly Convair's senior nuclear engineer.
- **Pratt & Whitney Div.,** United Aircraft Corp., says it will need more than 3,000 new employes by year-end and will start 1957 with 40,000 workers—several hundred more than peak employment of World War II. "Outstanding success" of J57 engine was cited as reason for needing workers. For the future, P&W is looking forward to the J75.
- **Raytheon Manufacturing Co.** received a $3.8-million contract from Commerce Dept. for 39 ground-based weather mapping radars. Each radar will plot storms over a 200,000 sq. mi. area and will give Weather Bureau a nationwide network when delivered in 1958.
- **Stockholders** of Bell Aircraft Corp. voted to set up the company's helicopter division at Ft. Worth as a wholly-owned subsidiary. Name probably will be Bell Helicopter Corp.
- **Plans** for early commercial production of CH-1A four-place helicopter have been revealed by Cessna Aircraft Co. with quantity deliveries slated for 1958. Company recently received an Army order for an evaluation quantity of CH-1As, designated YH-41.
- **Avco Manufacturing Corp.,** Crosley Division received a $25,150,558 Air Force contract to produce B-52 defense and armament systems plus an $18,467,-111 AF commitment for spares.
- **Republic Aviation Corp.** licensed France's SNCA du Sud-Est to build its F-84F/F-105 type ejection seat for use in the Dassault Mystere IV jet fighter and other NATO aircraft.

TRANSPORT

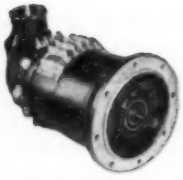
- **The Flying Tiger Line** became a stockholder in Air Cargo Inc., marking the first purchase of stock by an all-cargo carrier.
- **Wien Alaska Airlines** bought certificates of Byers Airways Inc., for $25,000. Byers reserves the right to operate as a pilot-owner.
- **United Air Lines** has moved its national sales and advertising and mid-west regional affairs departments from UAL's executive offices at Chicago's Midway Airport to 9th floor of Carson Pirie Scott & Co. building, 36 S. Wabash Ave.
- **TWA** was authorized by CAB to serve Tucson, Ariz., on its route between Albuquerque and Phoenix. N local traffic is to be carried Tucson-Albuquerque.
- **Continental Air Lines** extended to late September its option to buy five additional Vickers Viscount turboprops. CAL has a firm order for 15 Viscounts for delivery starting in March 1958.
- **British European Airways** celebrated its 10th anniversary Aug. 1 by carrying more passengers in 12 hours than it handled during its first full month of operation. Since August 1946, BEA has flown 1,336,000 hrs., carried more than 12 million passengers and earned $316,400,000.
- **Northeast Airlines** has inaugurated service with 40-passenger Smith CW-20T (modified C-46) in Boston-Burlington-Montreal operation. Aircraft is called the "Curtiss Commuter."

Jack & Heintz A-C System— Douglas DC-8 Jet Transport

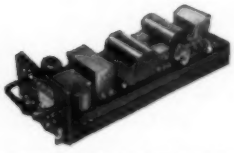
COMPONENT	NO. PER AIRPLANE
31008 Generator, 20 kva	4
51202 Voltage Regulator	4
50128 Control Panel	4
50137 Power Relay	8
50162 Current Transformer & Limiter Panel	4
50130 Bus Protection Panel	1
50124 Current Transformer (separate mtg)	12

Total weight—all components—380 pounds.

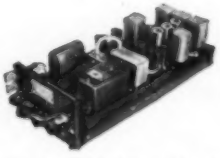
Jack & Heintz engineers and Douglas equipment section engineers discuss a-c system design at Santa Monica, Calif. Left to right, are: M. H. Peairs, electrical systems engineer, DAC; Peter Duyan, chief equipment section, DAC; Sid Webster, western district manager, J&H; A. W. Rebard, DC-8 group engineer, DAC; and Robert Sumner, field service representative, J&H.



J&H Model 31193 Generator†



J&H Model 51202 Voltage Regulator



J&H Model 50128 Control Panel

J&H Model 50137 Power Relay

Generators: rated 20 kva; meet Military Class C thermal requirements; will deliver 137½% rated power continuously for DC-8 operating conditions.

Hi-Phase* Voltage Regulators: protect against overvoltage from asymmetrical faults; provide accurate regulation with static components; utilize printed wiring.

Control Panels: simple central wiring harness; unique overvoltage relays insensitive to acceleration and vibration.

Power Relays: feature mechanical phase isolation and easy maintenance.

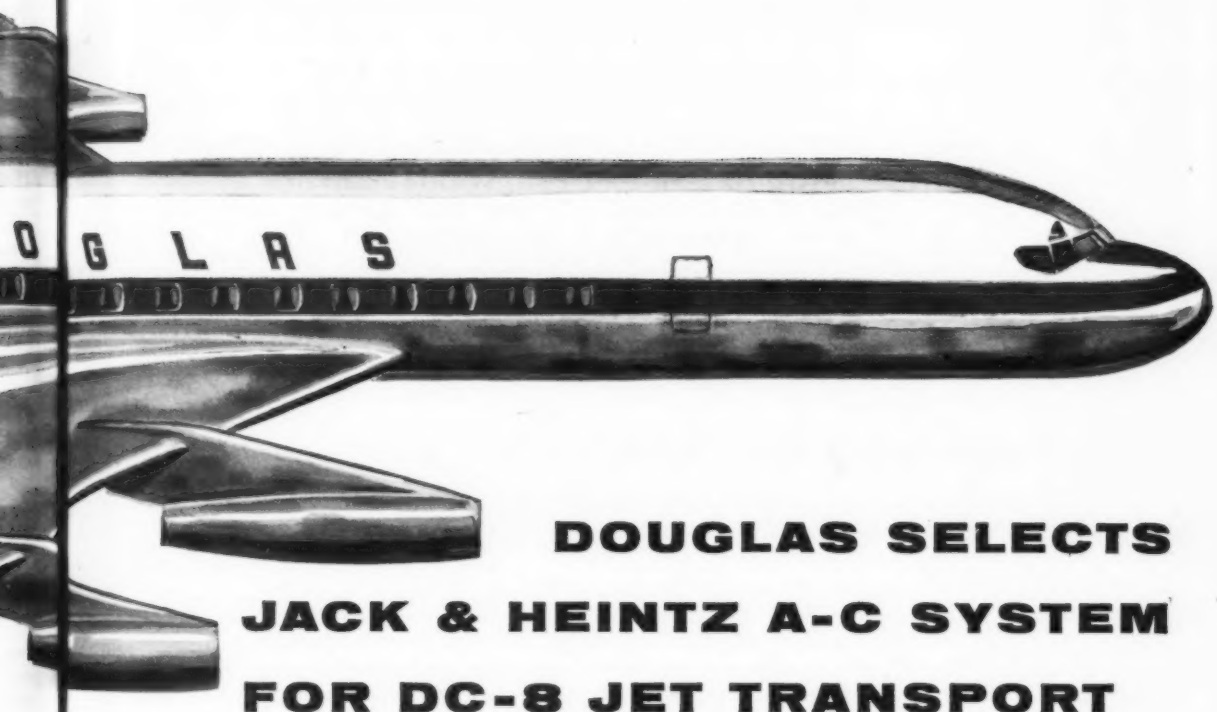
Current Transformer & Limiter Panel and the Bus Protection Panel provide relaying, metering and load division functions.

†Laboratory prototype for DC-8 system. This model is being superseded by J&H Model 31008 Generator.

*T. M. applied for

JACK & HEINTZ

AIRCRAFT ELECTRIC EQUIPMENT



DOUGLAS SELECTS JACK & HEINTZ A-C SYSTEM FOR DC-8 JET TRANSPORT

First A-C System Designed for Commercial Aviation

The a-c system designed by a team of Douglas and J&H engineers for the DC-8 is the first for a commercial airplane and incorporates in its design *tried and proved* principles in accordance with airline philosophy.

The ship-set components are simple in arrangement and automatic in operation.

Simplicity, Safety and Reliability are System Features

The system is as simple to operate as present d-c systems with all components readily accessible for easy maintenance.

The installation is designed so that the possibility of fault is remote. However, if a fault should occur, it is isolated quickly and automatically. Power to loads is interrupted only to those circuits affected.

Co-ordinated mechanical and electrical designs result in long reliable service life for components.

J&H Organization Proves Asset

Many factors were considered by Douglas in awarding the DC-8 a-c system contract. One primary factor in the selection of Jack & Heintz was its organization. Douglas considered it ideal for expeditious handling of an over-all system project. J&H conducts all research, development and production at *one* location, affording maximum engineering teamwork with minimum lost motion.

Important, too, is an intensive educational and maintenance support program which Jack & Heintz will offer the airlines to acquaint them with this new a-c system.

Whether your system problem is a-c or d-c, Jack & Heintz has the engineering know-how and complete facilities to meet your needs. Write Jack & Heintz, Inc., 17633 Broadway, Cleveland 1, Ohio. Export Department: 13 E. 40th Street, New York 16, N. Y.

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Circle No. 12 on Reader Service Card

SLASH IN AIR FORCE'S GOAL of 137 wings of manned aircraft may be in the works for Fiscal 1958. Reason: increased capability of Army tactical missiles and appearance of strategic missiles in operational AF units.

Such a prospect, cautiously outlined by AF Secretary Donald Quarles at recent Air Force Assn. session in New Orleans, may be one Administration answer to the massive appropriation USAF is seeking next fiscal year. Along with drastic manpower cuts for all three services, it would diminish the anticipated increase in overall defense appropriations.

Tactical Air Command would be hit hardest by any decision to give Army responsibility for providing its own tactical support, but Administration would insist that a cut in TAC not impair overall U.S. strength. As for Strategic Air Command, it presumably would get an equivalent missile unit for every wing of manned bombers it loses.

●

ELECTRONICS INDUSTRY IS BOOMING in west. About $1.25 billion worth of electronic equipment is being produced annually in an 11-state area along the west coast. About 80% generates in Los Angeles area. Each year since 1953 electronics manufacturing in area has grown 18%: there are now over 300 firms in field.

●

NEW ROLE MAY BE IN STORE for Air Force long-range cruise-type guided missiles once ICBM era arrives. USAF is pondering reconnaissance function with supersonic North American Navaho figuring most prominently in plan. But don't rule out Martin Matador and Northrop Snark.

AF also is looking into possibilities of large, unmanned satellite to provide electronic, photographic, infrared and weather data.

●

FIRST PENTAGON HINT of the invulnerability of ballistic missile launching sites: facilities will be constructed of such tough materials and dispersed so widely that a direct hit by an H-bomb will not destroy more than one-third of the capability of a given installation.

●

PROSPECTS GROW DIMMER for any sweeping military reorganization that would set up single service and single chief of staff. More modest steps—such as free transfer of personnel among the services—may have a better chance, but even these don't appear likely any time soon.

●

BLAME FOR ABRUPT CANCELLATION of Maj. Gen. Bernard Schriever's appearance at AFA convention has been pinned on Air Force Undersecretary James Douglas. He reportedly killed Schriever's role at New Orleans because the General's position was "too sensitive" to allow reporters to interview him.

Original program slated Schriever, who commands ARDC's Western Development Division and directs the USAF ballistic missile development program, to make a major missile presentation before the convention. Speech was read by Brig. Gen. Don R. Ostrander, asst. commander of ARDC for missiles.

●

NEXT TEST PHASE for the Bell X-2: altitude. It's expected plane will easily better the 90,000-ft. record for manned aircraft. It could also surpass its own 1,900-mph speed mark (see page 18) at same time.

Expediting development of an inaccessible area with helicopter . . . in transporting men, machinery, material.

World's Largest Turbo Transporter

Pours Out Its Power Through SPECO Transmissions

This mammoth turbine-powered helicopter of "1001" uses is the Vertol YH-16A. The production version will be able to carry up to 12 tons and can whirl into action without warm-up to achieve an air speed of over 150 mph. Transferring the output of its turbine into a smooth, steady flow of propelling power is the job of the forward and aft transmissions produced by SPECO, the Steel Products Engineering Division of Kelsey-Hayes.

The manufacture and assembly of gears and gear assemblies which insure dependable, maintenance-free performance such as required in the Vertol YH-16A is a Speco specialty, one of 40 years standing in service to the aviation industry.

Rotor transmission from YH-16. The transmissions, clutch assemblies, synchronizing shafts and drive shaftings are produced by Kelsey-Hayes in accordance with Vertol's design specifications.

KELSEY-HAYES

Kelsey-Hayes Wheel Co., Detroit 32, Mich. • Major Supplier to the Automotive, Aviation and Agricultural Industries

TEN PLANTS / Detroit and Jackson, Michigan; McKeesport, Pa.; Los Angeles, Calif.; Windsor, Ontario, Canada • Davenport, Iowa (French & Hecht Farm Implement and Wheel Division) • Springfield, Ohio (SPECO Aviation, Electronics and Machine Tool Division)

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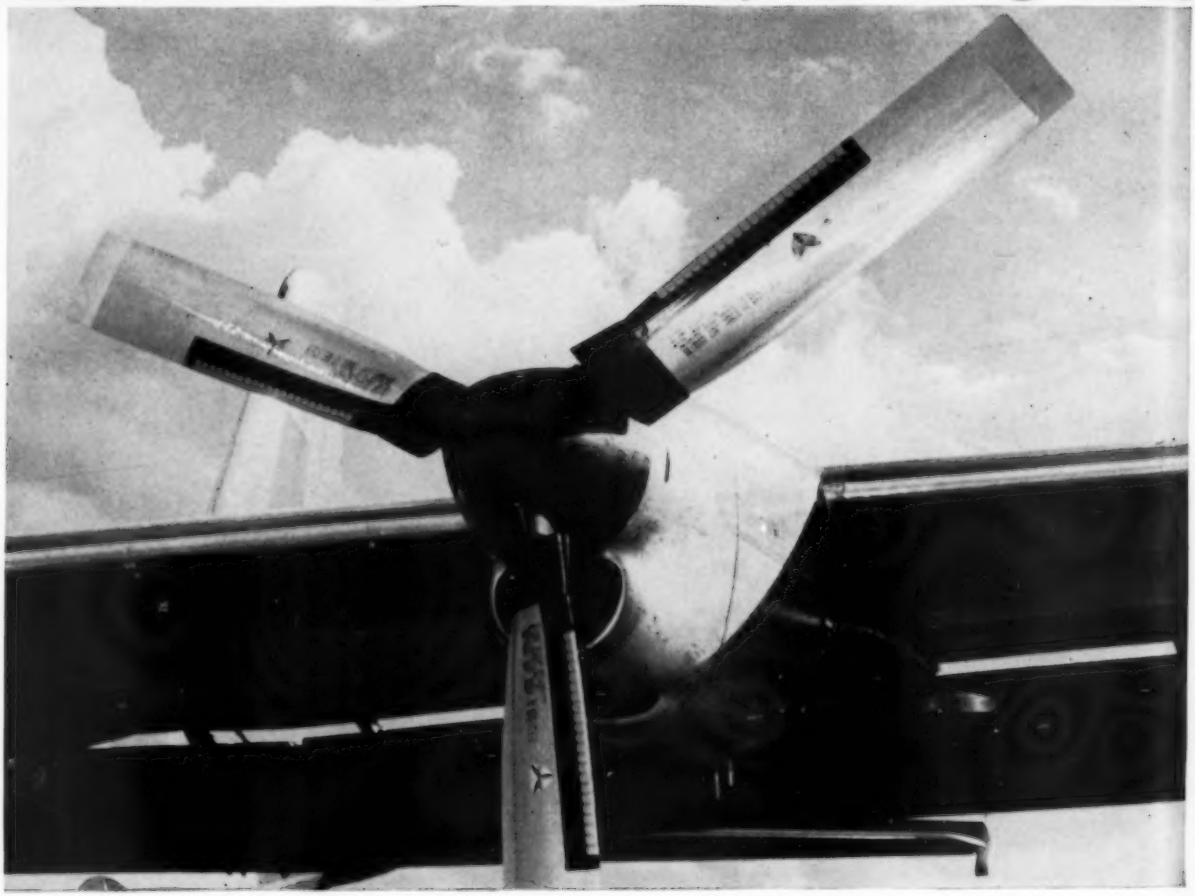

Blades that save pilots from close shaves with ice

THERE'S no need to dread propeller ice when blades, cuffs and spinners have complete protection like the Lockheed C-130 Hercules shown above. B. F. Goodrich electrical De-Icers are designed to put the required amount of heat on these vital propeller parts.

Resistance wires are sandwiched between rubber plies to form the desired heat pattern—then vulcanized into flexible, lightweight units for cementing directly to metal surfaces.

B. F. Goodrich electrical propeller De-Icers fit skin-tight around tricky curves and corners—give added protection against eroding effects of rain, sand and dust.

If you are looking for one of the most efficient ways to provide spot heat—whether for ice protection or heat control—B. F. Goodrich electric De-Icers and heaters are the answer. Successful applications include antenna masts, wing and empennage leading edges, oil lines, oil cell heaters, air intakes and radar equipment.

Perhaps these examples suggest a possible solution to your own ice or temperature control problems. B. F. Goodrich engineers will be pleased to give you expert help. *Aviation Products Division, The B. F. Goodrich Company, Akron, Ohio.*

B.F.Goodrich

AVIATION PRODUCTS Tires, wheels, brakes • De-Icers • Inflatable seals • Fuel cells • Avtrim • Heated Rubber • Pressure Sealing Zippers • Rivnuts • Plastilock adhesives • Hose and rubber accessories

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World's Largest Aviation Publishers
American Aviation

VOL. 20 No. 6

Here's Congress' 1956 Record on Aviation

More manhours were spent on airpower and other matters concerning the industry than ever before, but there's much unfinished business.

By FRANCIS J. KEENAN

PERHAPS NOWHERE else is there a more revealing index to the steady growth of American and world-wide aviation, both civil and military, than the chronicles of Capitol Hill. The Congressional Record, committee hearings and committee reports testify persistently to America's concern with the safety of air transportation and with the beguiling, tentative question of U.S. and Soviet military air power.

With these and other aviation questions, the second session of the 84th Congress wrestled longer and harder than at any previous session. While no statistics have been gathered, it is beyond serious doubt that Congress in 1956 devoted more manhours, on the floors of House and Senate, and in committee after committee, to matters of concern to aviation than ever before.

The record attests to that fact:

• The most comprehensive study ever made of the airframe industry.

• The prolonged investigation of the firing of former CAA Administrator Fred B. Lee and lengthy consideration of separating CAA from its mother agency, the Department of Commerce.

• The regular, but by no means routine, determination of Army air, Naval air and AF appropriations, as well as those for military assistance, military construction and for such agencies as CAA, CAB, NACA and others.

• The intensive, perhaps unparalleled, study of the relative strength of U.S.-Soviet airpower.

• The broadly liberalized provisions of the Renegotiation Act.

• The fight over dispersal of defense industries.

• The passage of measures like the ROTC Flight Training Bill, the Minister's Air Fares Bill, the Aircraft Sabotage Penalty legislation, and the exemption for much of the air travel in the Western Hemisphere of the 10% transportation tax.

But a good case can be made for this proposition: that the unfinished business of the 84th Congress may have been as significant for aviation as anything that Congress actually accomplished.

Note, for example:

• The surprise defeat in the last days of the session of the Airlines' Capital Gains Bill—once expected to be of great assistance in financing subsidized carriers' re-equipment programs.

• Sen. Stuart Symington's airpower investigation—even though it already has had great impact on the AF budget—can be expected to offer bristling findings and recommendations designed to galvanize the Defense Dept. to take more effective steps for air preparedness.

• The Nike-Talos anti-aircraft missile fight still rages.

• Nothing final has been heard from Rep. Emanuel Celler's Antitrust Subcommittee in its look at competition among the airlines; this group, however, has already succeeded in forcing a comprehensive CAB investigation of air fare levels.

What does all this activity show in terms of Congressional reaction to the insistent growth and emerging dominance of aviation? Does it reveal any kind of consistent attitude toward problems in military and civil aviation?

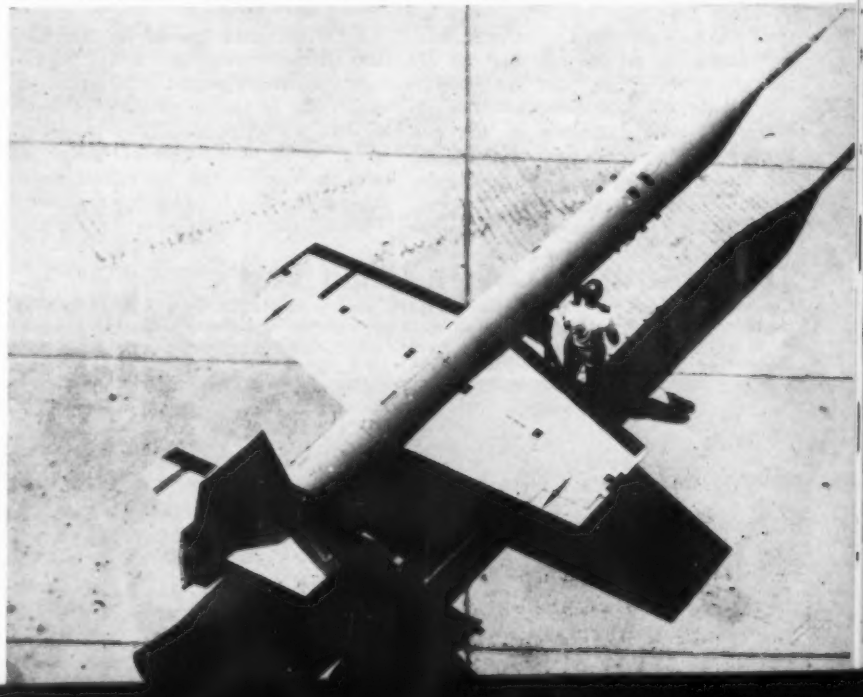
Clearly, this much is true of almost all Members: they are aware that aviation has been pushing aside all other transportation media in terms of growth and economic significance, that military aviation has become the chief bulwark of national defense, and that all aspects of aviation have exercised a rare fascination on the American people, in itself of great political significance.

Congress Attitudes

More specifically, these propositions can be advanced as guidelines to Congressional thinking about aviation:

First View of Supersonic Lockheed X-7

Air Research and Development Command has unveiled the Lockheed X-7 ramjet test missile. It is launched from a B-29, boosted to high speed by rocket and then powered supersonically by Marquardt ramjet engine. Missile is used for testing highspeed ramjets and missile components. Lockheed also has developed hypersonic X-17 ICBM test vehicle.



• Congress is willing to vote almost any amount of money for airpower, provided the Pentagon demonstrates a real need for it and asks for the money.

• Congress is especially sensitive to questions of air safety, which ultimately involve their constituents (as airline passengers) most directly. If aviation interests could agree on their needs, Congress would follow their recommendations.

• Congressional critics—though in a minority—are very much alert to what they view as abuses in the airline industry: delays in reducing subsidy, efforts to increase Federal support, restrictions on competition.

These Congressional attitudes—supplemented by a pragmatic viewing of each situation as it arose—ran through the aviation work of the second session. Briefly, and in general categories, these were the highlights of the session just concluded:

Air Traffic Control

Air safety was a dominant concern of Congress, springing from accidents, "near misses," the obviously overcrowded conditions at major airports, delays in flight schedules, and the imminent introduction of jet transports.

• Sen. A. S. Mike Monroney (D-Okla.) took up the cudgels early, first in defense of former CAA Administrator Fred B. Lee who, Monroney charged, had been fired because he wouldn't go along with budget restrictions forced on CAA by "ground-minded" Commerce Dept. officials. In lengthy hearings, Monroney tried to show the Administration had delayed the introduction of improved air traffic control equipment and generally held back CAA from efficient performance of its duties. He urged legislative action to sever CAA from the Department, but was unable to get his measure out of committee.

• Rep. Robert Mollohan (D-W.Va.) devoted primary attention to the organization of Federal aviation agencies. His House Government Operations Subcommittee found urgent need to speed up the study and implementation of new facilities; to restrain excessive military influence in the Air Coordinating Committee; to "drastically reorganize" aviation agencies; and to resolve civil-military conflicts.

Safety considerations were also invoked to obtain passage of legislation increasing penalties for damage or destruction of aircraft, including death where casualties are involved. Likewise, safety was invoked on behalf of bills banning the serving of alcoholic beverages on domestic flights, which passed only the House, and in efforts to obtain early Federal construction of a second Washington National Airport at Burke, Va.—a project once more postponed by the Senate Appropriations Committee.

• **CAA got** most of what it wanted from Congress by way of funds. Its regular appropriation included the full $40-million request for air navigation aids, and a later supplemental was approved with $35 million for air traffic control and navigation aid equipment, plus $10 million more for CAA operations under its expanded facilities program.

Airlines were absorbed, for a large portion of the session, with the Celler Subcommittee's airing of charges that the certificated industry conspired to block additional competition. Inspired in part, at least, by Trans American Airline's efforts to stay in business, the Celler inquiry has not yet been completed. More hearings are due this fall.

Legislative action included: authorization of free or reduced air fares for clergymen on a space-available basis; approval of an exemption from the 10% transportation tax for air travel to the Caribbean area, South and Central America, and portions of Canada and Mexico beyond 225 miles from the U.S. border; and provision for permanent certification of carriers operating within Alaska and Hawaii.

• The Senate passed, in the final days of the session, far-reaching legislation that would permit U.S. airlines to participate in the negotiation of international air agreements, and would restrict Presidential review of foreign air cases to those where considerations of defense or foreign policy were involved. The legislation grew out of hearings conducted by Sen. George Smathers (D-Fla.) into the negotiation of the U.S.-German bilaterals which gave Lufthansa Airlines attractive routes into the U.S. The legislation will undoubtedly be reintroduced next year.

Similarly, airlines will try again to win approval of at least a modified capital gains-reinvestment bill. Showing surprising strength, House opponents of the measure defeated it the day before adjournment on grounds it upset the "need" principle in making subsidy determinations and would prove a "windfall" for one carrier, Pan American World Airways.

Fight for Airpower

Two events on Capitol Hill dominated military aviation in 1956: successful Congressional efforts to boost the 1957 AF budget, especially for B-52 production and R&D spending, and the intensive, still-unfinished investigation of relative U.S.-USSR air power by a subcommittee headed by former AF Secretary Stuart Symington. The two were very much related.

Testimony before the Symington group—interpreted by many Democrats as evidence the U.S. was lagging badly in long-range bomber production and development of inter-continental ballistic missiles—supplied much of the steam behind these Senate-inspired increases: aircraft procurement up $800 million over Administration estimates to $6,848,000,000, and R&D up $100 million above requests of $610 million.

• **By the time** all its hearings have been printed, the Symington subcommittee will have collected about 2,000 pages of testimony—most of it in secret session and much of it deleted by Pentagon censors—from every top military and civilian official in the Army, Navy, AF and Defense Dept. involved with aviation. Two opposing streams of interpretation flowed through the mass of details.

Sens. Symington, Jackson, and Ervin contended that Administration budgetary considerations cut defense spending below levels needed to supply military commanders with "in-being" equipment of the most modern kind, and restricted important new areas of research, essential for maintaining qualitatively superior forces in the future.

Administration witnesses and their subcommittee spokesmen, Sens. Saltonstall and Duff, insisted that defense reductions in 1953 simply tightened up wasteful Korean War spending; that since then the U.S. has maintained the largest, most effective air forces in peacetime history; that Administration policy stressed qualitative superiority and adequate "in being" forces to deter Soviet aggression, rather than attempt to match Russian forces plane-for-plane.

Trailer Cuts F-102A Handling Cost

Convair-San Diego has cut cost of moving its production F-102A delta fighters from assembly plant to airport by 90% using a 13-ton eight-wheel trailer rig. Company figures it is saving $400 per plane with the trailer, which also has eliminated most of danger of damage during handling. F-102A formerly was moved by commercial van company.

• **The mass of testimony** provided evidence to support both interpretations. It also stimulated a comprehensive review of defense policy inside the Pentagon, indirectly roused Army and Navy protests against exclusive reliance on airpower, and obviously encourage Pentagon budget-makers to ask for substantial increases in their fiscal 1958 estimates.

What the subcommittee itself will recommend, however, must now await the November elections—after which its report will be released.

Other major actions of the Congress included:

• Authorization of flight training for Army, Navy and AF ROTC cadets.

• Postponement of funds for building 4 Talos anti-aircraft missile installations until the running controversy over whether Talos or Nike is the better weapon has been settled.

• Appropriation of $2,017,500,000 for foreign military assistance—about $1 billion below Administration requests—after a running battle throughout the authorizing and appropriating process between those demanding more severe reductions and Administration supporters seeking to maintain higher aid levels. The final appropriation appeared to cover the Pentagon's advanced weapons program providing modern jet aircraft, missiles and electronic equipment to NATO allies.

Airframe manufacturers were singled out for the most comprehensive study ever made by Congress into the aircraft industry's costs and profits.

After months of work, Rep. F. Edward Hebert's House Armed Services Subcommittee concluded thus: the Government is getting value for its investment in the industry; profits are not excessive; and the industry's condition generally is a "source of confidence." But it criticized: renegotiation practices, Pentagon differences in contract cost allowances, and the level of executive compensation.

• **The Renegotiation Act** itself was extended another two years, but only after major, liberalizing amendments were approved—in general, freeing smaller defense industries from many of the Act's requirements. Chief beneficiary: companies with renegotiable sales under $1 million, which are now freed entirely from the Act.

Congress approved another two years for the Defense Production Act with its system of priorities, allocations, tax assistance, etc. This time, however, it included a declaration of policy favoring additional dispersal of defense industries—a policy which won substantial Senate acceptance but brought enraged Representatives to their feet in one of the stormiest House sessions of the year. ◆◆◆

How Industry Will Benefit in New ROTC Flight Training Program

CAA-approved flight training schools in areas near colleges and universities participating in ROTC are most likely to benefit under the newly approved ROTC flight training program.

Colleges and universities will be prime contractors to the services under the program. They may conduct the instruction themselves or subcontract to nearby approved flight schools.

Navy will not get into the program immediately, but Army and Air Force expect to give 35 hours instruction to cadets chosen for flight training. USAF says it will provide instruction for 4,300 ROTC cadets at an annual cost of about $1,850,000. Training will be available at all 180 AF ROTC detachments and will be mandatory for cadets who apply as pilots in ROTC.

Army has classed flight training as extracurricular, but says it hopes to have 800 cadets participating annually at a cost of about $330,000. There are 235 institutions with Army ROTC units, but only those schools maintaining high standards in the overall ROTC program will be given flight training contracts.

• **The two services** will work together in instituting the flight projects. Where possible training will be consolidated. For instance, the Army initially will start the flight instruction at 40 schools of which 34 also have AF ROTC units.

Air Force earlier indicated it expected to flight train 1,625 cadets and the Army 400 in the first year of the program. However, because of the lateness of Congress in passing the legislation, both services will be considerably under the initial estimate. They expect to get the actual training going in the Fall, but it will be late next year or early fiscal 1958 before the program hits its planned stride.

First step now being taken by the military is to contact its ROTC institutions. All ROTC contracts will have to be written to include the flight training clauses. The military also must learn whether the schools intend to do their own flight training or to subcontract.

• **An Air Force** spokesman said a survey made some time back indicated only about 20 of the 180 institutions expressed a preference for providing the training themselves. The first schools to start the program, according to present Army planning, are those that already have an aviation association, such as the University of Illinois and some that are already contracting.

Flight training schools and fixed-base operators interested in participating in the program should get in touch with the closest university or college. The institution, not the service, will make the decision on the subcontract.

Lion's share of the new business for the flight schools obviously will come from the Air Force. Army will limit its cadet program to about five students per school initially. No such limit exists in the Air Force project.

• **AF expects** the flight program to cost about $430 per cadet of which $369.50 is for actual flight instruction. The Army estimate runs to $455 per student, since it must institute ground school courses, which Air Force already has.

However, cost estimates were derived from a national average. In actual practice, flight time will be paid at prevailing regional rates.

Equipment requirements are liberal. Any airworthy single-engine aircraft in the 65-200 hp class, whether tandem or side-by-side seating, will be acceptable. Standardized equipment is not needed, since principal objective of the program is to provide flight familiarization and ascertain pilot aptitude.

• **Standards** for flight schools and training are to be set up jointly by the Air Force and CAA. Latter has agreed to assume responsibility for administering and supervising the program. CAA agents will inspect facilities and equipment regularly.

CAA also will spot-check 10% of all cadets periodically and will give them their final check ride.

Flight schools will be required to insure government against public liability and property damage and instructor liabilities. Subcontractors will carry insurance in the amounts of $300,000 minimum public liability and $100,000 property damage.

The program should give hard-pressed and diminishing flight schools a financial base from which to continue operating.

National Aviation Trades Association sparked industry support for the training plan, with assistance from CAA and the Aeronautical Training Society. ◆◆◆

Bogus Parts Reported Flooding Market; CAA Taking Steps to Halt Practice

By LOIS C. PHILMUS

Use of "bogus" aircraft and engine parts in overhaul and repair of aircraft is increasing. The parts, inferior in both materials and workmanship, are known to be affecting engine and accessory performance and causing numerous failures. CAA officials are suspicious that cut-rate parts may have caused two or three accidents in the past year.

Under organized protest and pressure by the Aviation Distributors & Manufacturers Association, Civil Aeronautics Board adopted a Civil Air Regulation (Part 1.55) in August 1955. It provides for "engineering approval, source inspection, and identification of replacement or modification parts fabricated by persons, other than the prime manufacturer, which are sold through normal trade channels for installation on type certificated products."

The Regulation gives a shop six months to set up an approved inspection system. But since its adoption, only 25 out of more than 100 applicants have had their drawings, shops and inspection system approved, although CAA is still working with them.

• **Meantime,** thousands of the parts —particularly for engines—are flooding the market. CAA is now convinced that the Regulation alone will not secure the results desired. More and sterner measures are needed. First step recently was taken with the issuance of Aviation Safety Release No. 406, which specifies:

"All owners, operators, pilots, mechanics, repair stations, dealers, distributors, and manufacturers are hereby apprised that the installation of parts on type certificated products which have not been approved as complying with the appropriate Civil Air Regulations may be grounds for suspension, revocation or denial of the airworthiness certificate for the aircraft on which they are installed."

"If a replacement or modification part, not adequately identified, is installed on a certificated aeronautical product, such product is not eligible for approval or airworthiness certification unless the owner or installer can substantiate each such part." The Release has set up guide lines for helping to determine approved parts over "bogus" parts:

1. Parts produced by prime manufacturers will have approval tags affixed to larger parts or on packages of small parts, signed by CAA representative at the manufacturing source. After tags are removed, CAA will accept the prime manufacturer's shipping ticket, invoice or other documents as evidence that the parts are approved for use on civil certificated aircraft subject to receiving inspection for condition.

2. Approval tags also are attached to parts produced by persons other than the holder of the basic type design. In lieu of the tag, the symbol "CAA-PMA" must be displayed on each part or package of small parts, in addition to other identification required by CAR section 1.55.

3. Certificated repair agencies may fabricate and install replacement parts subject to individual substantiation and CAA approval, but such parts may not be sold through normal trade channels for installation on type certificated products, unless the manufacturer complies with 1.55.

4. Genuine military surplus parts may be used to maintain certificated military surplus products provided the parts are inspected for eligibility and condition with respect to materials, deterioration, damage, rated mechanical functioning, reliability and related qualities. The parts must also comply with any existing military technical orders, manufacturer's service bulletins, and CAA airworthiness directives, otherwise the type certificated products on which they are installed are no longer eligible for airworthiness certification.

• **CAA officials** feel that an intensive education program is one of the best ways to put the "back yard" companies out of business and to overcome the human trait of allowing the lure of a bargain to interfere with safety.

While the bogus parts manufacturers are scattered over the country, CAA has found the majority of them centered in two key cities: Miami and Los Angeles, with a considerable number in the New York area.

Most are small shop owners, turning out one or two engine or airframe parts, but there are several that have turned into big business, producing as many as 25 different parts for a particular aircraft. They usually specialize in one type aircraft, DC-3, C-46, etc.

While prime manufacturers must produce and stock all parts for their product, the bogus manufacturer produces only parts that have a known rapid replacement value. Thus, prime manufacturers are financially hurt. Customers buy the rapid turnover parts from the unlicensed producer and the prime manufacturer is stuck, only selling the long-life, expensive parts.

• **Some of the bolder** of the group go as far as actually camouflaging their product by literally counterfeiting the prime manufacturer's part number on the copy. Several have actually been known to imitate the original manufacturers packaging in an organized effort to create the impression that it is the original product.

Actually, the bogus manufacturer is open to civil suit by authorized and prime manufacturers—if he can be caught. The act of copying blueprints, drawings, and the actual product is a violation. Also, some of these so-called spare parts manufacturers are in violation of the Federal Trade Commission Regulations, on grounds of product misrepresentation.

The aircraft owner, maintenance base, or any other person buying manufactured bogus parts could bring fraud action in the courts. But the difficulty in tracing the parts to their source is almost overwhelming.

• **CAA** has been working on new legislation that would provide better tools for policing this mushrooming industry. Under the Civil Aeronautics Act, CAA can prosecute such copiers only if it can prove that the party "knowingly or willingly forges or counterfeits or makes false statements in CAR certificates." Or if CAA can prove that a failure caused by the part "interfered with air navigation." Obviously, more direct prosecution methods are needed.

But no matter what legal or legislative action is taken, the best weapon to combat the alarming increase of use of the inferior parts is the user.

• Accurate surveillance of each and every part must be maintained.

• Misleading advertising in trade journals, which just intimate at CAA certification, must be closely watched.

• Too-low a price tag for the item should be a tip off.

Airlines and general aviation have been and are being victimized. Both old and new aircraft and engines are targets. A concerted CAA-industry-user education program to bring home the alarming increase in the manufacture of the phonies must be launched. ◈◈◈

Chance Vought Gets Regulus II Contract

The Regulus II, an improved version of the Regulus I surface-to-surface guided missile, will be built for the Navy by Chance Vought Aircraft Corp. under a $12-million contract. The Dallas company has been building Regulus I for several years.

It is understood that Regulus II is considerably larger and more powerful than the earlier model, which is powered by an Allison J33 centrifugal flow turbojet engine. Range is also said to be greater than the 600 miles given for Regulus I.

GE Bids for Big Share of Civil Jet Sales

By JOSEPH S. MURPHY

CINCINNATI — General Electric Co. has entered the commercial jet and turboprop engine business for keeps.

The choice of its CJ-805 (J79) on the Convair 880 jet transport sold recently to Trans World and Delta Air Lines is only the beginning. Another G-E turbine, the turboprop T58, now undergoing military qualification tests at the company's Small Aircraft Engine Dept. at Lynn, Mass., may even see civil use in passenger helicopters before the CJ-805.

And by 1963 G-E officials expect to have no less than five turbine engines available for commercial use. Still to come are a larger turboprop than the 1,024-horsepower T58, and both a larger and smaller jet.

"If it were just a matter of selling the J79 commercially on the Convair jet, we never would have even started," J. S. Parker, head of G-E's Aircraft Gas Turbine Division told AMERICAN AVIATION in an exclusive interview.

• **Parker figures** the commercial move involves an estimated $40-$50 million initial investment, a sum obviously not justified solely by the successful sale of the commercial J79 on the Convair transport.

Actually, the CJ-805 program, as well as those designs to follow, are all part of an extensive company study of propulsion requirements for flight over the next 25-year period.

This takes in not only commercial but military needs and includes jet, rocket and even nuclear powerplants. In addition to work by its own market researchers, G-E has engaged New York aviation consultant R. Dixon Speas on a continuing basis over the past four years as part of this program.

As for its first venture, that on the Convair 880, Parker expects the military J79 will have about 300,000 operating hours behind it when the first jet is delivered late in 1959. By the end of 1960 this will grow to one million hours.

• **G-E is wasting no time** in getting under way with the CJ-805 program. First tests are already in progress on one phase of its development program involving trials with a noise suppression device. Unlike the situation on the Douglas DC-8 and Boeing 707, G-E has taken the position that both noise suppression and thrust reversal are problems for the engine manufacturer to work out and Convair has gone along with this thinking on the 880.

As to the schedule for first engine delivery, G-E is committed to supply its first CJ-805s to Convair in 1958, well in advance of the first airplane delivery in November of 1959. On this basis, company engineers figure the final commercial specification for the engine will have to be firmed up by Sept. 1957.

Four executives concerned with GE's commercial jet engine activities: J. S. Parker, gen. mgr., aircraft gas turbine div. (top left); J. D. Wethe, mgr.-marketing, Evendale operating department (top right); Neil Burgess, J79 project mgr. (bottom left) and R. L. Carter, CJ-805 project mgr. (bottom right), both in GE's jet engine department.

• **During the next 14 months** G-E engineers will be working out detail design specifications covering features of the commercial engine that will differ from the military J79. Most prominent of these involve testing of the J79 without afterburner and a switch from magnesium, probably to steel, to conform to customer and CAA thinking on better compressor-blade containment in commercial jet engines.

Heading the CJ-805 project in G-E's Jet Engine Department is R. L. "Nick" Carter, under Neil Burgess, manager of the military J79 engineering program. Before moving into the CJ-805 slot, Carter was J47 and J73 project manager.

Both Carter and Burgess are of one opinion as to the CJ-805 capabilities in commercial operation. They figure the initial overhaul period will start out between 400 and 600 hours and eventually rise as high as 1,500 hours.

And if G-E experience on its J47 engine is any yardstick, their estimates might well prove most conservative.

• **On the J47 engine,** the company found itself in the strange predicament of losing several hundreds of millions of dollars in production contracts when the reliability of its engine far exceeded initial military expectations, J47s now operating in the Air Force's Boeing B-47 bombers have a 1,700-hour overhaul period and indications are this may be increased by USAF to 2,000 hours.

In all, G-E has built 31,000 J47s and some 5,000 others were turned out by Studebaker-Packard as a second-source producer. Besides the six-jet B-47 installation, four J47s are used to augment piston engines in Convair B-36s and in North American F-86D and F Sabres and FJ-2 Fury fighters. With this array of applications, the J-47's 36,000-unit production gives G-E the most heavily mass-produced design to date and one that may never be exceeded.

This broad experience with J47 operation is one that could have its impact on the company's commercial plans. Although the final decision on overhaul of the CJ-805 engines will rest with the customer, G-E has built up a wealth of experience in overhauling J47s for the military, a factor that might sway some airlines, particularly smaller carriers, from the past habit of setting up their own overhaul facilities.

And G-E will have another "experience factor" to offer its commercial customers with the J79. Only last month Air Materiel Command officials put their stamp of approval on a new plan for handling spare parts, one that will give G-E a wealth of know-how in predicting engine parts' usage well in advance of the introduction of the first commercial engine.

The J79 spares handling at G-E is slated to last for the first two years of that engine's introduction into service. G-E officials, however, are optimistic that if it is as successful as they feel it will prove, it may still be in effect in 1959 when the first CJ-805s come into use.

• **Last, but far from least,** phase of G-E's CJ-805 program is its plan for commercial sales and service. Heading this activity is J. D. Wethe, manager of marketing for the company's Evendale Operating Department.

To Wethe falls the new role in G-E of administering a commercial sales and service program, negotiating warrantees, and providing technical service representation. Here the company expects to fall back on the know-how of some 350 field service representatives now in its engine program.

Although these technicians will not do double duty on commercial engines, their current assignment at virtually every key location in the U.S. and abroad will place them on tap to assist in the CJ-805 program whenever needed.

Actually, the move by General Elec-

tric into the commercial turbine market is not surprising considering its past record as a military engine producer. It not only produced the first U.S. jet engine, the I-A, which powered the Bell P-59 on its first flight in 1942, but also pioneered development of the first turboprop, the T31.

In quick succession, G-E then developed the centrifugal flow J-33 and axial flow jets, both of which were turned over to General Motors' Allison division for production at the close of World War II. This was at a time when Pentagon thinking (and that of some G-E officials) was inclined toward easing the company out of the engine business.

This thinking didn't prevail for long, however, when G-E engineers came up with the J47, first rated at 4,850 pounds thrust and later reaching 6,000 pounds. Air Force selection of the J47, first on the F-86 Sabre and later on the B-47 jet, put G-E in the jet engine business to stay.

As to the commercial market, G-E officials now look to this business as one that will stabilize its operations and provide a broader economic base—one that is not completely dependent upon military orders. It will tend to smooth over the "bathtub" situation that 100%-military business often brings whenever a gap exists between phasing out of one model and start of production on another.

It is just such a situation that G-E finds itself in today at Evendale. With J79 output now gaining momentum, total production this year will run between 150 and 200 engines. This is less than one-fourth the number G-E turned out in a single month at the height of its J47 program. ◈ ◈ ◈

Navy Breathes New Life into Flying Boats

By HENRY T. SIMMONS

After encountering more than its share of development troubles, the Convair R3Y Tradewind turboprop flying boat is recapturing much of its old promise for the Navy.

This was disclosed by Rear Adm. C. S. Cooper, Deputy Chief of the Navy Bureau of Aeronautics, and Rear Adm. William A. Schoech, Assistant Chief of BuAer for Research and Development, in response to a series of questions posed by AMERICAN AVIATION.

After a long and difficult time of it, the two officials said, they are again feeling more optimistic about this program.

Rear Adm. James S. Russell, Chief of BuAer, revealed last year that the chief difficulty with the R3Y was the failure of its Allison T40 turboprop engines to achieve the power and specific fuel consumption originally estimated for altitude operation.

• **To bring** the altitude performance of the engines up to the level originally expected would have required larger turbines and a complete gear-box redesign, Russell said. This would have amounted to a new engine design and this course was rejected because of the time and expense involved.

The Navy decided on two less ambitious fixes to make up some of the performance loss: reduction of engine rotational speed to eliminate some turbine choking losses at normal power ratings and an increase of 50°F in turbine inlet temperatures at normal power.

The fixes are expected to recover some but not all of the expected engine performance, according to Adm. Cooper and Adm. Schoech. They estimated that the changes would make up one-third of the 15% power loss at altitude as well as recover one-third of the 15% over-run in specific fuel consumption.

To make up the loss in range imposed by the higher fuel consumption, extra tankage and a strengthened hull were added to the R3Y, boosting its gross weight from 165,000 pounds to 175,000 pounds. This technique was employed because of the "blessed margin of power for take-off" permitted by the engines, despite their shortcomings at altitude, according to Adm. Russell.

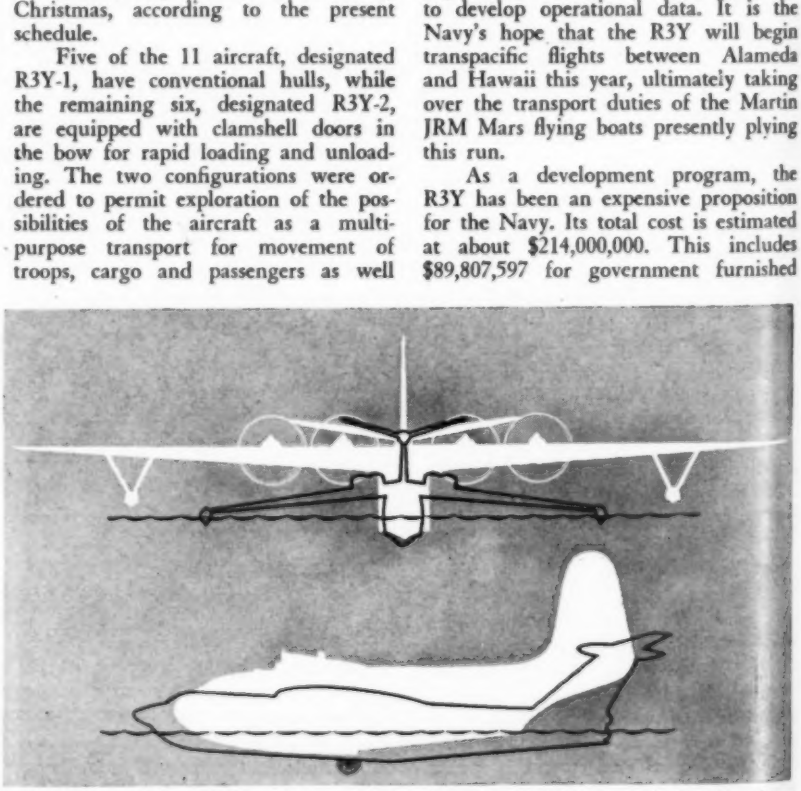
• **The Navy originally** ordered 11 R3Y flying boats, all of which have been completed. Five have been delivered to VR-2, a Navy transport squadron at Alameda, Calif. One is undergoing trials at the Naval Air Test Center, Patuxent River, Md., before delivery to VR-2, and the remaining five will be delivered by Convair to VR-2 by Christmas, according to the present schedule.

Five of the 11 aircraft, designated R3Y-1, have conventional hulls, while the remaining six, designated R3Y-2, are equipped with clamshell doors in the bow for rapid loading and unloading. The two configurations were ordered to permit exploration of the possibilities of the aircraft as a multipurpose transport for movement of troops, cargo and passengers as well as an amphibious aerial beach landing barge for the Marine Corps.

Since the original requirement was laid down for the R3Y, the Navy discovered it also has excellent potential as an aerial tanker for in-flight refueling. Using probe and drogue equipment supplied by Fletcher Aviation Corp., the R3Y can refuel four Navy fighters simultaneously. All 11 of the big seaplanes will be equipped with refueling equipment, the Navy said.

VR-2 is now beginning an extended training program with the plane. In the near future it will commence "increasingly extended flights at varying loads" to develop operational data. It is the Navy's hope that the R3Y will begin transpacific flights between Alameda and Hawaii this year, ultimately taking over the transport duties of the Martin JRM Mars flying boats presently plying this run.

As a development program, the R3Y has been an expensive proposition for the Navy. Its total cost is estimated at about $214,000,000. This includes $89,807,597 for government furnished



Silhouette of Martin XP6M multijet superimposed on white silhouette of Martin Mars shows how abrupt steps and sharply curved contours of old conventional hulls have given way to narrow streamlining that permits 600-plus mph speeds for seaplanes.

equipment and approximately $124,000,000 to be paid Convair.

Though this cost appears enormous when allocated to the individual aircraft (more than $19 million each), the Navy believes the expenditure was justified because the program brought to light so much that was unforeseen and unforeseeable, particularly in the development of turboprop engines, gear-boxes, propellers and associated equipment.

• **The difficulties** with turboprop power encountered in the R3Y and its predecessor, the XP5Y patrol aircraft, may have influenced the Navy in the direction of turbojet propulsion for transport flying boats as well as combat aircraft like Martin's spectacular P6M-1, now undergoing flight tests.

Commenting on the Martin jet flying boat last year, Adm. Russell made this point: "Although designed strictly for combat applications, its ability to lift a most imposing amount of pure cargo and to transport it at high cruising speed indicates that a somewhat similar, jet-powered seaplane would be a versatile tactical transport."

The P6M represents a vast aerodynamic improvement over previous flying boats because its hull makes no aerodynamic concessions to the fact that it must land and take off from water. This means that the seaplane, for the first time, is aerodynamically equal to its sleek land-based counterpart while retaining all the mobility and other advantages of water-based aircraft. Behind this breakthrough in flying boat design is the tremendous power available in modern jet engines, making it possible to bring seaplanes into the air without relying upon severe hull "steps" and other devices producing great aerodynamic drag.

Ultimately, the flying boat may recapture all the prestige it enjoyed before World War II, but its backers in the Navy agree that much additional effort will be required before this comes to pass. Nevertheless, they maintain that the costs of development will be more than made up by savings in other areas —particularly in huge concrete runways and taxiways—and that from a military point of view, such effort is essential to disperse the nation's striking power beyond any possibility that it might be wiped out overnight in the event of a sudden attack. ◆◆◆

Trend in flying boat design has been toward longer, sleeker lines as shown in these photographs, from top: Consolidated (now Convair) PBY; Martin PBM-3; Convair R3Y and Martin XP6M. Breakthrough came on P6M with hull aerodynamically equal to its landplane counterpart yet satisfies all hydrodynamic requirements. Length-to-beam ratio is improved and its step is moderate in size compared to predecessors. Windtunnel tests evidence no drag differential to best comparable landplane body.

Why the Shift to Solid-Propellant Rockets?

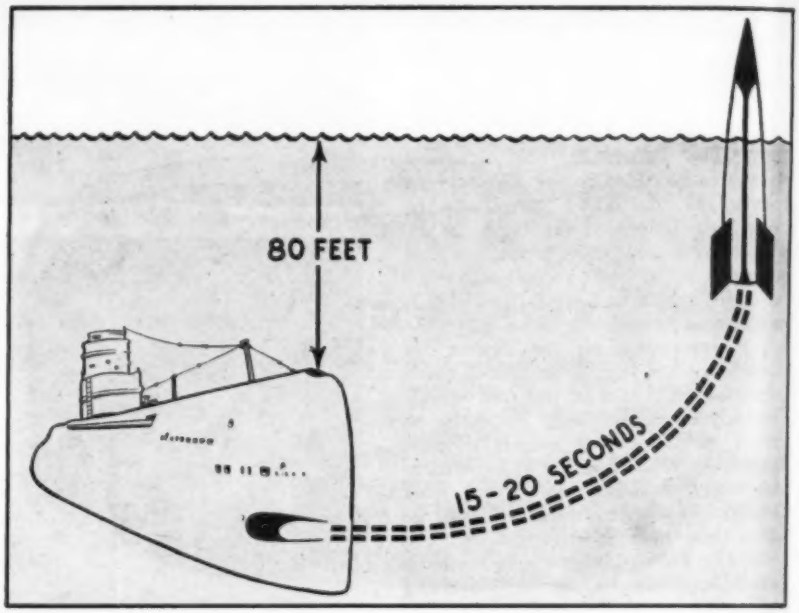
By ERIK BERGAUST

Biggest military contract ever awarded for high-energy solid-propellant research and development has gone to Reaction Motors, Inc. Plant and laboratory expansion is in full swing at Denville, N. J. Company's level of effort in solid-propellant research has increased five-fold during the last few months.

There is a shifting of the wind in the field of rocket propulsion. GIs and sailors don't like to mess around with liquid oxygen (temperature minus 297° F), alcohol, poisonous white and red fuming nitric acids and many other hazardous liquids. In many cases the fueling of a missile requires costly time—in addition to complex handling facilities.

Consequently, extensive research in the field of solid propellants has been encouraged to the degree where one can now speak of a solid-rocket-propellant industry.

Good reason for the stepped-up work in this field is the fact that our laboratories have found new high-energy fuel binders that yield terrific impulses with certain oxidants.



Feasibility of high-energy solid propellants can best be visualized in terms of submarine missiles now being studied intensively by many companies. It will take from 15 to 20 seconds for a torpedo-sized sub-missile to reach the surface when launched from submarine at 80 feet depth. Because of water back pressure, ascent is relatively slow; as much as 90% of the propellants are left in the missile as it zooms aloft from the surface.

Army-Navy Pursue 'Solid' R&D

The Army has long favored solid-propellant rockets from a handling point of view, but to date solid rockets have been inferior to liquid units. As a matter of fact, solid propellants had been practically doomed—until it was discovered that there is ample room for improvement through utilization of some 'new and exotic' elements.

With new high-energy solids, the Army's rockets of the Honest John type will get a significant boost. Indicative of the new trend is that the Army now hopes to develop a solid-propellant Nike missile.

• **Most significant** is the fact that the Navy is going all out for development of a solid-propellant Jupiter type FBM (Fleet Ballistic Missile). Furthermore, increased interest in missiles that can be launched from submersed submarines stem from obvious feasibility of the new high-energy solids. Several companies are understood to be pursuing different sub-missile programs; among them are General Electric, Avco, General Dynamics, Aerojet and Hughes.

It is assumed that there is a close connection between Reaction Motors' current solid-propellant R&D contract and the Navy's intermediate range FBM. Navy confirms that this missile is designed to be fired from both surface vessels and submarines. The propellants involved are, of course, classified, but it is considered safe to assume that work is concentrated in the field of composites.

Top: Reaction Motors engineer operating strand-burner bomb for determining rate of strands of new high-energy solid propellants. Bottom: Intricate grinding of high-energy solids to required particle size.

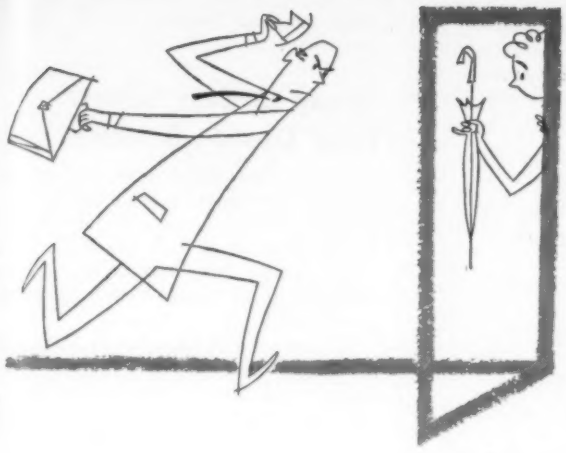
High-Energy Composites

In the low-cost categories the trend among many of the solid-propellant producers has been toward a composition of ammonium nitrate, carbon black and synthetic rubber. A somewhat more sophisticated recipe includes different synthetic linear polymeric binders used with inorganic crystalline oxidizers.

Of course, almost any polymer is suitable for a fuel-binder in composites, but the fine details involved in processing, and the physical factors of the composition, which will determine the performance of the propellant, are classified.

Metallic powder, such as aluminum, has been used in different composites, and this concept has not been dropped by Reaction Motors. Although the company cannot confirm that metallic powder (probably much more "exotic" than aluminum) will be used in the new propellants now under development, it is anticipated that some experimenting will be conducted along this line.

• **Of particular interest** in the composite propellant field are the light metal perchlorates and nitrates. Lithium perchlorate is among the better oxidants for



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composite propellants, but it is very hygroscopic and its combustion products are solids.

A tremendous amount of research must be undertaken to find the right compositions, and factors such as availability of chemicals, handling hazards, price, etc. play an important role. The fact that literally thousands of combinations of elements must be tried out is quite a challenge to the propellant engineer.

In view of the different high-energy solids, Kurt R. Stehling, head of Project Vanguard propulsion branch, has calculated that it is perfectly feasible to build a solid-propellant moon rocket. With an initial gross weight of 26,000 pounds, a balloon-launched three-stage rocket will be capable of planting a four-pound instrument load on the moon's surface.

First stage would have a 236,000-pound thrust, using a cluster of three solid rockets. Second-stage thrust would be 14,000 pounds; third stage 1,100 pounds. These calculations are rather indicative and characteristic of the new trend.

The Air Force is said to be interested in such a project, and it is, of course, backing a substantial amount of solid-propellant research. Immediate practicallity of high-energy solids, as far as the Air Force is concerned, is connected with advanced high-speed air-to-air and air-to-surface missiles.

• **Although Reaction Motors** is doing considerable work in the field of liquid rocket propulsion, the solid-propellant R&D contract has been a major factor in the company's expansion program. The new multi-million dollar laboratory and headquarters facilities at Denville are possibly the most modern in the industry. Company officials say their relatively new static test-stand facilities are "ready for the high-energy solid motors—any time."

Significance of the OMAR constellation (Olin Mathieson-Marquardt-Reaction Motors), which offers a combined service to the military and industry for technological advancement, probably was a good reason for the military to award the current R&D contract to Reaction Motors. Not overlooking the fact that RMI is the oldest and one of the most important pioneer rocket companies in the country, the OMAR group arrangement seems to yield increased business to all three companies. ◆ ◆ ◆

Solid Propellant Properties

(Source: American Rocket Co.)

Propellant	Type	Pressure Range, psi	Low Pressure Limit, psi	I_{sp}, sec	n	k/cr	B, in/sec	d, g/cm³	T_{ign}, °C	T_{comb}, °C	Cost, $/lb	Exhaust
CALCIT, Alt. 161	C	1350-3700	700	186	0.75	0.23	1.4-1.5	1.8	400	2000-2500	1.00	1
Ballistite Res. Unres.	DB	1000-3000	200	200	0.85	0.58 1.32	-	1.2-1.7	200-300	2500-3000	5.00-10.00	4,5
Black Powder	C	100-1000	15	70	-	-	0.1-0.5	1.2-2.1	190	2000-3000	0.50-1.00	2
Cordite	DB	1000-3000	300	180	0.77	0.70	-	-	300	-	-	4,5
LOX-Rubber	SL	100-500	15	225	-	-	-	-	-	-	-	3
Micro-grain	C	50-100	15	25	-	-	-	-	-	-	0.50	2
NDRC Type EJA 2188	C	600-1000	-	180	0.45	0.28	0.2-1.0	1.8	-	2000-2500	1.00	2
NDRC Type EJA 480	C	600-1000	-	180	-	0.33	0.2-1.0	1.8	-	-	-	2
WASAG DSGM	H	700-4000	700	180	0.73	-	0.2-0.8	-	195-200	-	2.00-5.00	4,5

C: Composite, DB: Double-Base, SL: Solid-Liquid, H: Homogeneous
(1): White Smoke, (2): Gray Smoke, (3): Smokeless, (4): High Flash, (5): Black Smoke

Army Orders Seven New Design Studies

Seven new design studies, of which three are devoted to heavy lift "flying crane" helicoptors and four aimed at development of shaft turbine aircraft engines, have been ordered by Army's Transportation Research and Development Command.

Parametric design study contracts for flying crane helicopters went to: Hiller Helicopters, Palo Alto, Calif., $70,031; Aircraft Div., Hughes Tool Co., Culver City, Calif., $54,700, and Piasecki Aircraft Corp., Philadelphia, $58,815.

Following companies received similar contracts for shaft turbine engines: Studebaker-Packard Corp., Detroit, $57,690; Continental Aviation & Engineering Corp., Detroit, $52,308; Lycoming Div., AVCO Mfg. Corp., Stratford, Conn., $59,113, and Turbomotor Div., Curtiss-Wright Corp., Hempstead, N. Y., $50,085.

Steel Salvage at LA

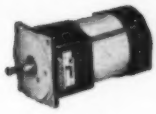
The recent steel strike made high pressure steel pipe hard to get and it may now be worthwhile for the Los Angeles International Airport to pull out the FIDO system which it installed several years ago with unsatisfactory results.

The CAA authorized abandonment of the experiment about a year ago, but piping and burners were left in the ground because salvage value at that time didn't justify the removal cost.

Canadair's CL-28 Patrol Bomber

This is first drawing released by Canadiar Ltd. of its CL-28 patrol bomber. Powerplant comprises four Wright Turbo Compound engines. Airframe is basically that of Bristol Britannia. A transport version, the CL-44, is likely to be built with turboprop engines.

E-6011



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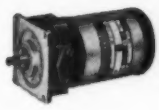

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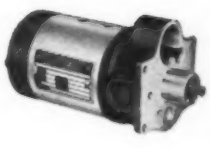

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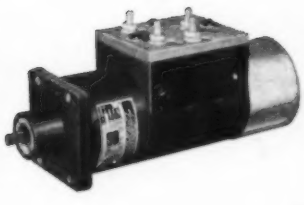

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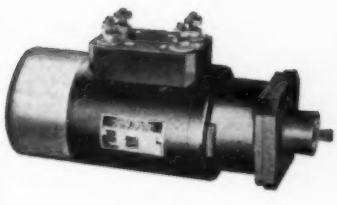

E-6032

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E-6015	12.0 oz.	26 v dc	.029 hp at 14,500 rpm
E-6415	12.6 oz.	400 cycle ac	.04 hp at 10,500 rpm
E-6022	2 lb., 1 oz.	26 v dc	.22 hp at 10,000 rpm
*E-6422	1 lb., 14 oz.	400 cycle ac	.15 hp at 9,250 rpm
E-6025	5.4 lb.	26 v dc	.75 hp at 9000 rpm
E-6032	8.25 lb.	26 v dc	1.5 hp at 6750 rpm
*E-6440	8.0 lb	200 v 3ϕ ac 400 cycle	2.0 hp at 11,250 rpm

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Why Profits Fail to Keep Pace With Sales

By SELIG ALTSCHUL

Increased appropriations for air power as focused upon the B-52 and KC-135 programs have had a tendency to obscure a number of other major trends within the aircraft industry.

The major emphasis of the Air Force aircraft procurement program is presently centered in the B-52 heavy bomber being built by Boeing at its plants in Seattle and Wichita. The KC-135 jet tanker also being built by Boeing in the Seattle area is receiving added emphasis. All told, present plans call for the production of 598 B-52s and 400 tankers.

In addition, Air Force Chief of Staff Twining is reported to be seeking 300 more B-52s which would further augment production requirements to be placed upon Boeing.

Boeing Backlog $2.1 Billion

• **As the focal point** of these procurement programs, Boeing's military backlog alone has swelled to more than $2.1 billion and assures the company of sustained sales volume for the next few years.

Of course, major production programs continue for other types of aircraft for the Air Force and Navy. For example, North American Aviation remains in high volume output of the F-100 Super Sabre fighter series.

The Convair Division of General Dynamics also has been busy though it is still in the initial low-production stage with the F-102 interceptor. Late this year, it also expects to fly the B-58, a supersonic medium bomber. Douglas, for its part, has a series of jet fighters and small bombers being produced for the Navy.

Military work also figures prominently at other aircraft assembly lines. Lockheed has started production on the F-104, a new supersonic fighter. Fairchild obtained an increase in its contracts for the C-123 cargo and assault plane. Cessna is picking up momentum on its T-37 trainer contract for the Air Force.

Not all prime aircraft builders, however, have been so fortunate. Northrop, for example, has placed its stockholders on notice that its F-89 fighter contract will be completed this month without additional production awards in sight. The company has an Air Force evaluation contract for a jet trainer but it is much too early to anticipate a production award in this activity.

In general, while the industry as a whole for 1956 may equal or top the $8.2 billion of sales of last year, profits probably will not match those of 1955.

• **More important,** there will be wide variations in sales among the separate companies. Profit experiences will show even wider disparities for the individual units. As in the past, selectivity will continue to shape the destinies of the various aircraft firms with the relatively greater rewards going to those excelling in technological proficiencies.

The spotlight may be on Boeing and its huge B-52 and KC-135 programs. But it is important not to overlook many major cross-currents now in motion which will have a vital impact on the industry and all of the companies engaged in it. Most important are the following elements:

• GFAE—Government Furnished Aircraft Equipment.

• Subcontracting processes.

• Commercial aircraft orders.

GFAE runs into substantial magnitude. For example, the J-75 supplied by the Pratt & Whitney Division of United Aircraft Corp. which powers the B-52, KC-135, F-100, and other military planes, is purchased directly by the Air Force. Military commitments for this engine (and the J-57) no doubt bulk very large in the last reported backlog of $1.85 billion for United Aircraft Corp.

Extensive instrumentation and controls going into the separate military planes also affect wide areas of specialty companies. Much of this equipment is purchased directly by the military, others by the prime contractors.

• **Outside production** or subcontracting is known to have averaged anywhere from 25% to 45% of the total on Boeing contracts for the B-47 (a medium-sized bomber) and the B-52. As a result, a wide segment of the aircraft industry benefits from the overall heavy bomber and jet tanker programs.

A typical group of subcontractors for the Boeing programs include: Beech, Bell, Cessna, Chance-Vought, Fairchild Engine and Airplane, Glenn L. Martin, Republic, Rohr, and Temco. This is to say nothing of the many other vendors who are not prime aircraft builders.

It is known, however, that competitive bidding for these subcontracts is rather intense. As a result, profit margins on this business tend to be lower than on prime contracts.

Commercial Orders Rise

Commercial orders for transports are figuring more prominently than ever before in the aircraft industry's backlogs. However, in this instance only a handful of companies are involved and include Boeing, Convair (General Dynamics), Douglas, Fairchild and Lockheed.

Considerable development expenses will be incurred in these commercial programs and will affect earnings being generated on military business. This is now being demonstrated in a number of interim reports that have been released thus far.

• **For example,** Boeing has orders for 88 707 jet transports representing an aggregate of almost $500 million in business from U.S. and foreign airlines. Deliveries are scheduled for late 1958. Development expenses are likely to run high in this program, but are expected to be absorbed in current operations.

Reporting for the first quarter of

How Iroquois Jet Will Be Mounted On B-47

Canadair Ltd. has designed and built an engine pod for the starboard rear fuselage of a borrowed B-47 for testing Orenda Engines' new 20,000 lbs-thrust Iroquois turbojet. Artist's conception of installation is shown.

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1956, Boeing revealed sales of $171 million, compared with $192 million for the like 1955 quarter and $266 million for the fourth quarter last year. Despite indicated good profit margins on military business, net earnings for the 1956 March quarter were $1.88 per share as compared to $3.09 per share for the 1955 fourth quarter.

Douglas also has been busy in civilian lines. In fact, its commercial billings, which accounted for 10.5% of its total sales last year, are expected to increase during 1956. The company recently reported a backlog of 278 piston-powered aircraft of the DC-6B and DC-7 series. Additionally, orders for 114 of the DC-8, its entry in the jet transport race, have been received. As a result, Douglas' total commercial backlog is in excess of $1 billion.

But while the DC-6B and DC-7 series now are on a profitable production basis, considerable development expenses still must be absorbed by the firm on the DC-8 program. As a result, while Douglas reported sales of $454 million for the six months ended May 31, 1956 compared with $436 million for the same period last year, net income before taxes was down to $25.9 million as contrasted to $28.3 million for the 1955 period.

• **A newcomer** to the transport list, Fairchild Engine & Airplane Corp. has had to absorb heavy developmental expenses. It has decided to build, under license from Fokker of Holland, the twin-engine F-27 turboprop transport. Thus far, firm orders for 23 airplanes involving an aggregate booking of $12.4 million have been received. In addition, 25 more planes are under option.

Largely as a consequence of the F-27 program, Fairchild reported sharply lower earnings for the March 1956 quarter of $142,000 as compared with $1,103,000 for the first quarter of 1955.

Lockheed recently reported a commercial transport backlog of $465 million out of its total order book of $1.3 billion. In the Lockheed commercial backlog are the conventional piston-powered Super-Constellation series 1049Gs, the 1649As, and, more important, the Electra.

It is the Electra which is expected to incur substantial developmental expenses, While sales for the March 1956 quarter were about unchanged from a year ago ($187.6 million as against $190.4 million), net income was down from almost $4.6 million in the 1955 first quarter to $4.4 million in the current period.

Martin Earnings Decline

• **Even companies** without civilian transport development expenses are showing difficulties in increasing their rate of earnings. For example, the Glenn L. Martin Co. reported a substantial increase in sales for the quarter ended June 30, 1956 compared with the same 1955 period ($87.8 million as against $65.6 million). Yet with this 34% increase in sales, net income was down to $2,855,507 from $3,410,709.

Northrop is even in a sharper earnings decline despite a rising sales curve. For example, for the nine months ended April 30, 1956 on sales of $227 million, it reported a net income of $4.5 million. Yet, for the same period last year, it showed sales of $214.9 million and a net income of almost $9 million.

These individual experiences demonstrate that despite bulging backlogs, the industry as a whole has no assurance of uniform profitability. Competitive pressures to obtain subcontracts are not without their effect. Furthermore, Congressional investigations have intensified close-pricing on the part of military contracting officers. Moreover, renegotiation processes will continue to exercise a restraining influence. The Renegotiation Act recently was extended to January 1, 1959.

The aircraft industry, as a group, is blessed with volume bookings at sustained high levels in the period ahead. But there are no assurances of profitable operations ensuing in the same measure. For this reason, selectivity, always a pronounced feature of the aircraft industry, will assume even greater significance in the future. ◈◈◈

Workhorse to Get Turboprop Power

Vertol Aircraft Corp. will modify two standard H-21C helicopters to turboprop versions under a new $1.8 million BuAer-Army contract. Two GE T-58s will be installed in place of present Wright R1820-103 reciprocating engine. Company says new powerplants will increase payload 40%, speed 50% to 150 mph. Picture shows where T-58s will be mounted.

Douglas Gets Own ILS at Tucson

An instrument landing system is being installed at the Tucson Municipal Airport for the exclusive use of the Douglas Aircraft Co. Tucson had never needed ILS because this famous resort city in the heart of the southwest sun country practically never experiences conditions of low visibility.

But the Douglas Long Beach division's flight test facility is located at Tucson—where there's a 12,000-ft. runway—and it needs an ILS to check out the autopilots on B/RB-66 twin-jet bombers it produces for the Air Force. Up to now it has had to fly to El Paso or back to Long Beach for this test procedure.

Douglas obtained the ILS, localizer and glidescope from the Air Force on bailment for one year and it is being installed, operated and maintained by the CAA under contract to the Tucson Airport Authority; but because of the special arrangements it is only for Douglas test use and is not to be considered a commissioned facility.

Republic Releases Details on F-105

The supersonic F-105 Thunderchief has short, very thin swept-back wings and a long cylindrical fuselage, Republic Aviation Corp. said in releasing first external details on its new fighter-bomber. The J57-powered plane is now undergoing tests at Edwards AFB. Production models are to have the more powerful P&W J75.

Air intakes are located in the wing roots, as in the case of the F-84F Thunderflash, to permit installation of radar and other equipment in the nose. The plane features a one-piece flying tail, or "stabilator," set low on the aft section of the fuselage with a ventral fin on the underside to provide lateral stability.

GE Gets Big ECM Contract

A USAF contract for more than $43 million has been received by General Electric Co. for production of airborne electronic countermeasures equipment for radar jamming. Contract calls for a possible additional amount to purchase spares that would bring the total to $55 million.

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Wanted: Electronic Cure for Collisions

Here are some of the problems involved in the development of new safety devices; radar remains the key.

By HENRY P. STEIER

Programs to reduce the hazard of air collision by development of new electronic gear will force engineers to face an unusually knotty technical problem.

Aside from the obvious remedy—positive air traffic control of all aircraft at all times—it is generally conceded that the problem must be tackled by development of some sort of radar device.

Groups such as the Air Transport Association, Airborne Instruments Laboratory, Inc., and Cornell Aeronautical Laboratory, Inc. have had the problem under study for a long time. More recently Bendix Radio, division Bendix Aviation Corp. and Ramo-Wooldridge Corp. have made known their activity in the work.

Ten years ago AIL analysed the problem in the light of known electronic techniques and the extent to which those techniques could be useful in the solution.

• **Bendix** recently revealed results of an initial survey of the fundamental physics of aircraft collision problem. The company said that although its report was an "interim" one, it appeared "to be a disservice to the aviation industry not to make the report available at this time."

• **Ramo-Wooldridge** has not made known its stand on the various technical issues involved. It is believed, however, the company is well along with development of a basic design and has proposed it to ATA for further development with airlines backing.

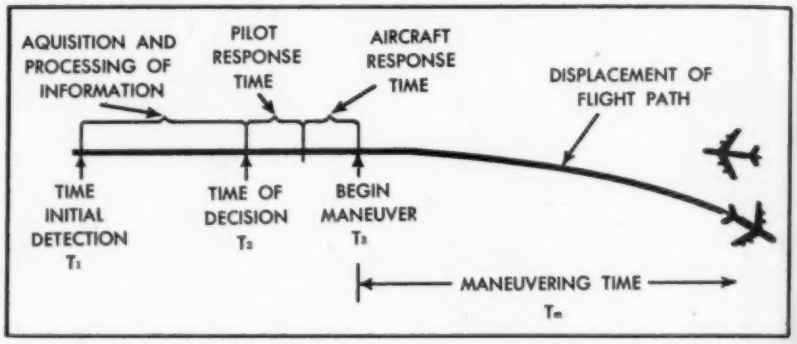
Human Eye Fails

The human eye, it was pointed out in the 1946 AIL study, is far superior to any existing radar as a collision avoidance device. Once it sees a moving object it estimates distance on the basis of apparent size and then determines the closure rate by noting size change.

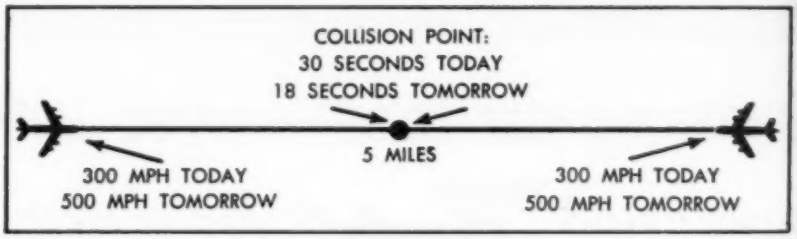
When the other object is still closer, the eye observes relative heading and "classifies" the object as to cruising speed and relative bearing. The brain then takes action as necessary.

Today although the capabilities of the eye are those a workable collision device should have, things are different. The eye is no longer quick enough.

As was pointed out in the report of the Aviation Facilities Study Group to the Director, Bureau of the Budget in 1955, two Northrop F-89's approaching head-on would appear as a speck on the windshield at the distance of one mile. It would then already be too late to take action because four seconds later the planes would be at the collision point.



Basic divisions of time in management of collision avoidance are shown in upper diagram. Cornell Aeronautical Lab's James Q. Brantley, Jr. believes these elements must be considered irrespective of the avoidance system employed. Overall time for action is shown in lower diagram if a five mile detection range is assumed for detection equipment. Increased speeds reduce data processing time, but other times remain the same for specific aircraft.



• **Coupled with** the need to get forward azimuth, elevation, and speed information, areas around the plane need surveillance as well, since the probability of a head-on collision is slight compared to overall probability from all other directions. Visual detection is out of the question for this job.

Attention of planners has been centered on avoiding emergency rather than coping with it. This implies mild escape maneuvers and early warning of aircraft proximity.

Violent maneuvers could of course be made, but acceleration values in severe escape maneuvers are an important consideration to passenger comfort and safety, as well as to permissible stresses on large transport aircraft.

Time becomes the essence of the problem in early warning. It is needed to acquire information and process it for the pilot. After that the pilot must make his decision whether to evade or proceed. Then time is needed for the aircraft to begin to respond and then for maneuvering.

Unfortunately the time from pilot decision to end of the maneuver will stay nearly the same as flight speeds increase, but the time to acquire and process information will be reduced as aircraft speeds and closure rates go up.

Electronic Systems

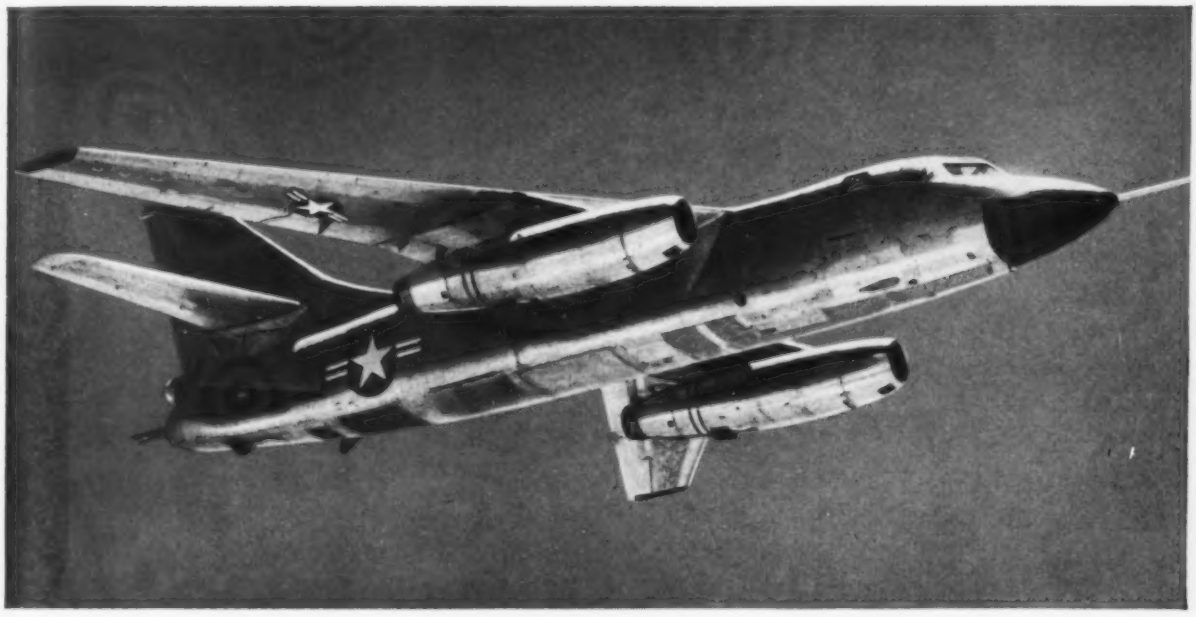
So far, three types of electronic systems for collision avoidance are known to have been considered: cooperative, self-contained or partial self-contained systems.

The cooperative system would employ transmitters and receivers in all aircraft. These would cooperate by responding to each others interrogations.

CAL's electronics engineer, Dr. James Q. Brantley, in 1949 made the problem the subject of the thesis for his graduate work at Cornell University and has continued the work with CAL since that time.

Brantley has suggested that the simplest cooperative system would

"EYES" FOR THE AIR FORCE TACTICAL AIR COMMAND



Air Force RB-66 powered by Allison J71 Turbo-Jet Engines

Here you see the Tactical Air Command's newest reconnaissance bomber—the all-weather twin-jet Douglas RB-66.

It carries a payload of nuclear or conventional bombs—which it can wing at 600-700 mph to targets dictated by the nation's needs.

It packs a full complement of camera equipment —which also makes it a valuable reconnaissance tool for air intelligence.

And in pods under its wings it boasts a pair of Allison J71 Turbo-Jet engines — each producing 10,000 pounds' thrust without augmentation — which take it to altitudes over 40,000 feet.

Now winning its wings for reliability and dependability with the 363rd Tactical Reconnaissance Wing at Shaw Air Force Base, S. C., the Allison-powered RB-66 carries a three-man crew as it goes on its peace-maintaining missions.

The Allison-powered Douglas RB-66 is another example of how continuous engine development —both Turbo-Jet and Turbo-Prop—is helping keep America first in the air.

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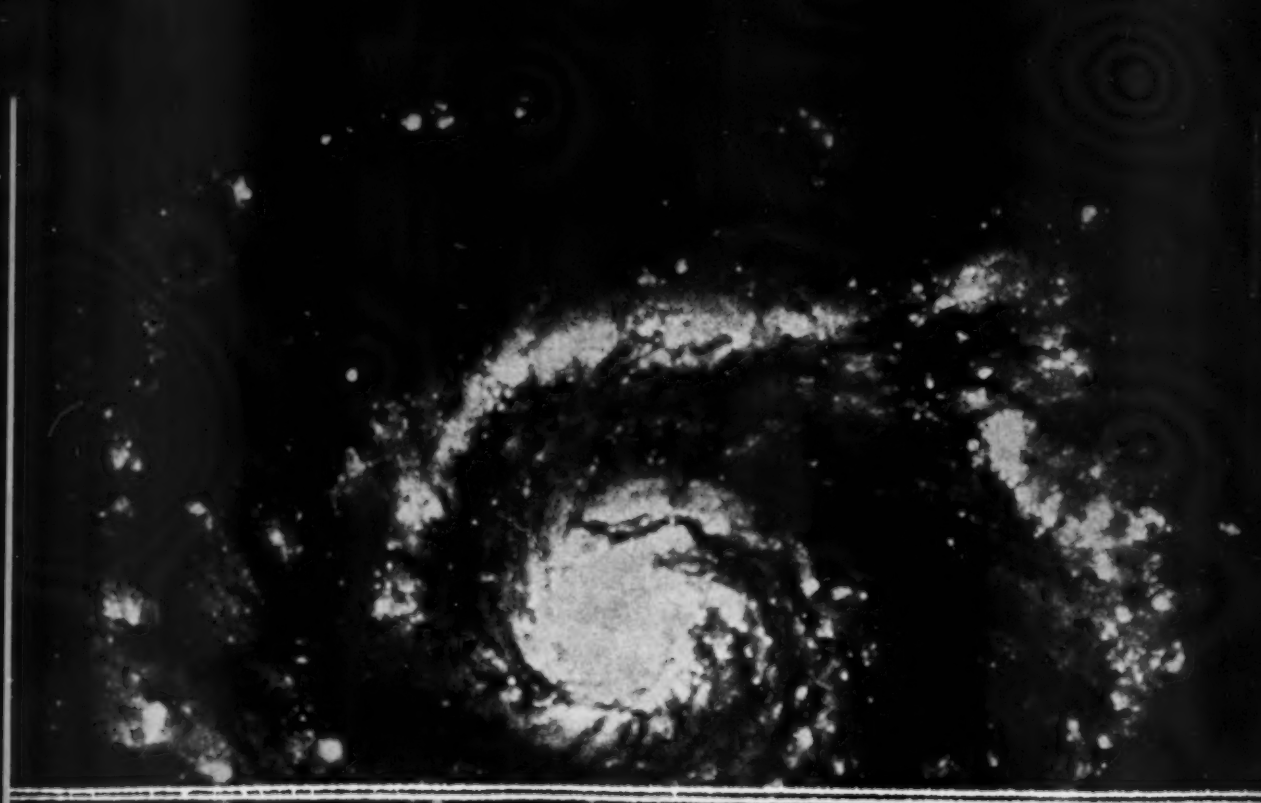

Lockheed scientists are designing

WINGS FOR THE ATOM

Domesticating the atom to serve mankind has intrigued science for over a decade. One top priority application, secretly under way for several years at Lockheed: developing a nuclear-powered plane as different from present types as a supersonic jet is from the first stick-and-wire biplane.

IMAGINE A GIANT AIRCRAFT SOARING ALOFT, NOT WITH TONS OF GASOLINE, BUT WITH A URANIUM FUEL SUPPLY NO BIGGER THAN A HANDFUL OF GRAVEL. EVENTUALLY, SUCH A PLANE-OF-THE-FUTURE—WITH THIS SCANT FUEL SUPPLY—WILL GIRDLE THE GLOBE NON-STOP BETWEEN SUNRISE AND SUNSET.

More than a dream, this incredible aircraft is now being developed by Lockheed for the U.S. Air Force despite problems of propulsion, structures and materials, thermodynamics, crew survival, producibility and maintenance unique in aviation.

Old concepts are being shelved, traditional solutions rejected. *The kind of aeronautical advances that once took a generation of research are now being telescoped into a few months, even weeks.*

Soon several hundred nuclear scientists and engineers from Lockheed's Georgia Division will move to the North Georgia mountain country. There on a vast site—some 40 miles from U.S. Air Force Plant No. 6 at Marietta, operated by Lockheed—will be built the nation's largest facility for the development of atomic-powered aircraft.

The exact status today of U. S. atomic plane

development is still a military secret. But the strategic importance of the "A-plane" to our nation can hardly be exaggerated. It will be an aircraft with a new dimension—endurance unlimited. Its immense range and round-the-world patrol capabilities are certain to revolutionize air logistics—freeing military aircraft from shackles presently imposed by fuel capacity and airbase location.

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LOCKHEED'S NEWS COLUMN

Detection of Heart Disease—*our nation's #1 killer—is being speeded with aid of Lockheed's battery of super-fast electronic brains that are correlating the studies sponsored by the Nash Cardiovascular Foundation. Ten minutes' work sandwiched between computations at the Missile Systems Division gives the cardiologist complete and accurate harmonic analysis of electrocardiograms that speed his vital research immeasurably . . .*

Radiant heating, first time used in *any* airliner, will be one of the many new creature comforts of Lockheed's up-coming propjet Electra. Heating wires in walls and ceilings work like electric blankets to give no-draft, no-hot-spot comfort . . .

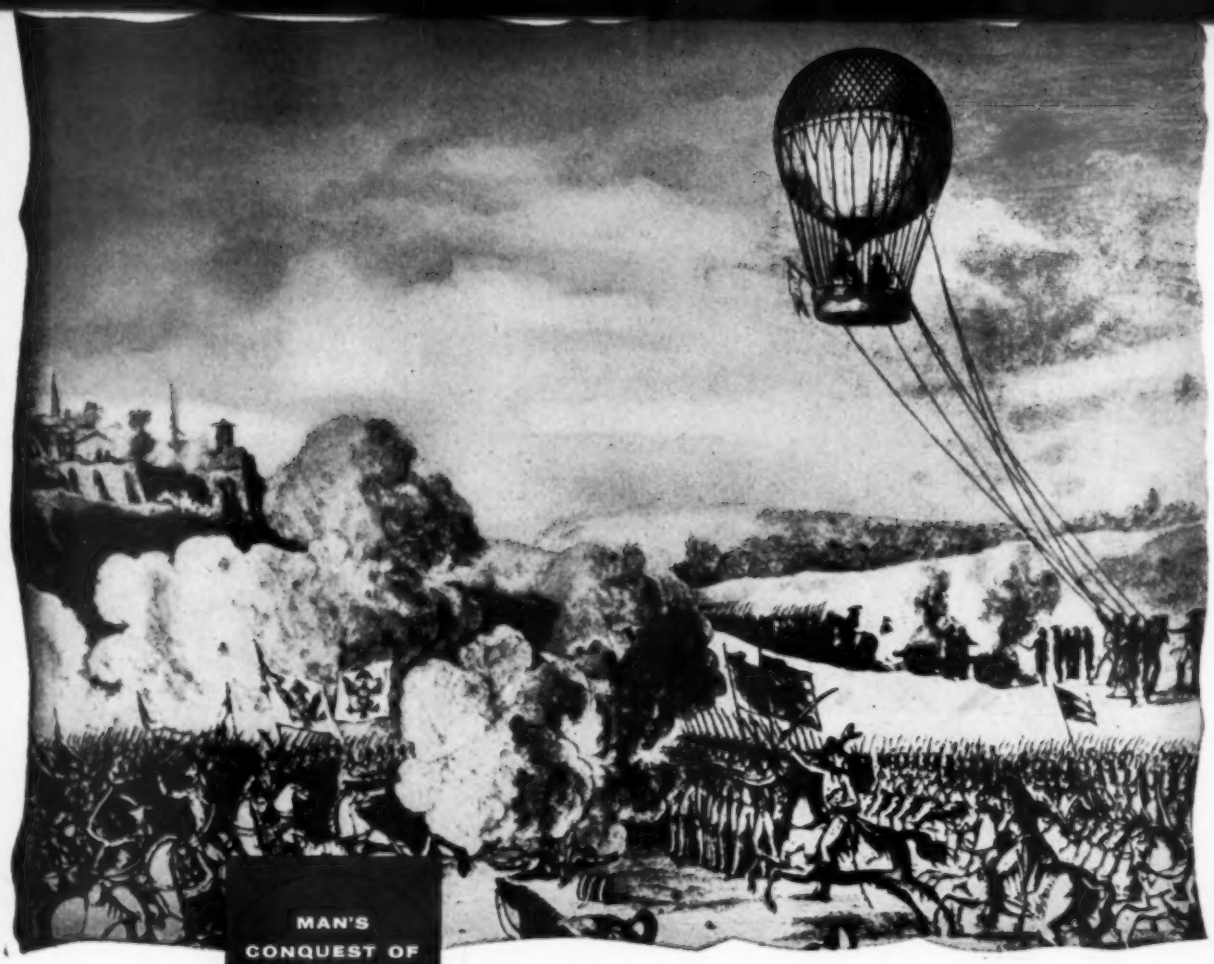
Atomic plane concept on a recent cover of Newsweek was *not* based in any way on Lockheed's Georgia Division ANP (Aircraft Nuclear Power) Project. That plane will *really* surprise you . . .

25,000 Lockheed stockholders in every state of the union learned in mid-August that sales reached approximately $345 million for the first half of 1956. In a like period 20 years ago sales were less than *one* million . . .

Univac's newest cousin Si *(for Scientific) will be the top quiz kid in the battery of analogue and digital brains at Lockheed's Missile Systems' Computer Center. Si, first Model 1103A Univac in use, "thinks" up to 100 times faster than other computers . . .*

A nationally-known Los Angeles physician, after periods of intense nerve strain, goes to the airport, buys a round-trip ticket to New York on a Super Constellation, spends a quiet day at the Waldorf-Astoria, and comes back on the next flight. Says: "It relaxes me" . . .

Hercules C-130 performance data *just released show that the USAF strong-man can haul 20 tons of cargo right on the contrails of a fast jet tactical force. 100 mph faster than present combat transports, Hercules climbs fully loaded to 2500 feet altitude in just <u>one</u> minute.*



MAN'S CONQUEST OF THE AIR

First aerial observation of battle

Undoubtedly an important factor in the victory of Napoleon's forces at the Battle of Fleurus in Belgium in 1794 was, believe it or not, aerial reconnaissance. For in this battle Captain J.M.J. Coutelle—"Captain of Napoleon's Aerostiers"—became the world's first military balloon observer. For hours Coutelle's balloon hovered over "no man's land" and even over the enemy's lines. With signal flags he and a companion relayed vital information back to the French Army Commander.

Coutelle continued his aerial reconnaissance for Napoleon at Mayence in 1796 and elsewhere. But in Egypt, where he had been ordered in 1798, his balloon equipment was finally destroyed in a naval battle.

Man's conquest of the air has come a long way from the uncontrollable balloons of yesterday to the sleek, earth-circling giants of today. Since the advent of powered flight, Esso research has helped speed the progress of aviation by creating new and improved fuels and lubricants for military and commercial aircraft.

8 OUT OF 10 OF ALL THE WORLD'S INTERNATIONAL AIRLINES USE

Esso

AVIATION PRODUCTS

merely be an alerting system to show presence of another aircraft within radio range. He pointed out, however, that problems of unnecessary alerts in high traffic density areas might render such a warning device useless.

• **Another system** might code the transmission to convey altitude information. Selective codes could be used to transfer signals only to planes at the same altitude. With radar techniques range could also be given, and perhaps azimuth and other data.

The cooperative system looks good from a technical standpoint as a relatively easy means of achieving an air-to-air data link which with a computing device could give a pilot information needed for collision avoidance.

The consensus at this time, however, is in favor of a self-contained or self-sufficient system. The basic "flaws" in the cooperative technique are the political and economic aspects. These might well be the greatest challenge to any expected full implementation of all aircraft with a cooperative system.

The Radio Technical Commission for Aeronautics came out recently in favor of a Proximity Warning System to "provide useful service." Report 112-56/DO-71 by Special Committee 74 set forth the operational requirements for a proximity warning system which it said represents "an initial approach to the problem of avoidance of mid-air collisions between aircraft in flight."

• **SC-74** called for capabilities that will provide useful service, and which will furnish operational experience and technical data which will facilitate "the later development and use of a Collision Warning System."

The RTCA system would have an alerting signal and an indicator which displays sufficient information to permit the pilot to take positive evasive action.

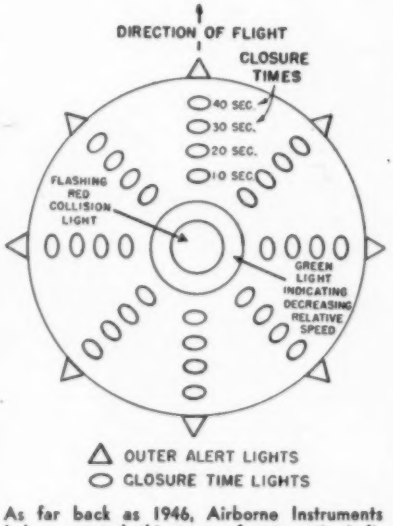
Operational requirements set forth by RTCA for a Collision Warning System as against a Proximity Warning System state the need for "precise information on aircraft positions and on their relative speeds and courses," as well as "utilization of a suitable computer to resolve these data for the calculation and indication of collision hazards." No stand was taken on self-sufficient versus cooperative systems.

CAL's Brantley told AMERICAN AVIATION he favors the self-sufficient system. The Ramo-Wooldridge system, it was learned, is the self-sufficient type. Bendix researchers dug deeply into the physics of the problem, and examined the necessary accuracy, range and similar requirements of a system.

• **The Bendix report** said, "The word 'prevention' is a euphemism at best, and becomes meaningless under a strict interpretation. All we can hope for is to reduce the risk of collision to a level low enough to be acceptable. Ultimately the selection, the implementation, and the evaluation of any solution must be governed by a weighing of many chance elements."

At this time, Bendix is cooperating with ATA's recently enlarged committee handling the equipment development program. The committee, headed by William Littlewood, American Airlines vice president, is said to feel an interim device could do 90 percent of job, while an "ultimate and complete collision warning device might take two to three years to develop . . ."

Brantley believes use of some form of doppler radar would be the best approach for getting a self-sufficient collision warning system. The so-called doppler effect, when used with a continuous wave radar, transmits electromagnetic energy at a known frequency. Signals reflected from targets within the radar range show the same frequency when received back from stationary targets and different frequencies from moving targets.



As far back as 1946, Airborne Instruments Lab suggested this type of automatic indicator as a possibility for use in collision avoidance. Relative bearing within 45° would be shown. Closure time indications are considered important as they allow pilot discrimination of how violent the avoidance maneuver should be.

The frequency shift can be used to determine relative speed of the target. This shift could be used to provide an automatic warning of approaching aircraft. Such a system equipped with computing elements could predict impending collisions on a closure rate basis and establish an appropriate evasive maneuver.

Brantley points out that such a system would not give relative altitude information, and would require means of getting spherical coverage around the plane instead of just forward from the nose of the aircraft.

He also believes the doppler technique would fill an important existing need for tornado detection. Unlike thunderstorms, where there are large vertical velocities, tornadoes have horizontal velocities that could be detected by the doppler method.

• **Present radars** are not believed to be of much use for tornado detection. They rely on coorelation between heavy turbulence and high echo intensity gradients from areas of heavy rainfall. A doppler radar collision prevention device would have the capability also of distinguishing between a slow moving cloud and a fast moving aircraft in the cloud.

Brantley notes also that echoes received from propeller driven aircraft with doppler have a considerable amount of amplitude and frequency modulation. If detected by audible means, he says an experienced observer can distinguish between single- and multi-engined aircraft in this way.

Such an effect might ultimately be used for identification of targets, as well as for determining the closure rate between aircraft. CAL points out it might also be used to measure ground speed, rate of ascent and descent, and altitude.

Warning Time

Big stumbling block to development of a collision warning indicator could be the measurement and indication of azimuth. Bendix points out the two questions that must be answered. Is there risk of a collision? How best to avoid it?

In the ultimate system mere proximity existence is not enough. A risk might be presumed from proximity, but in the final analysis how to avoid it becomes paramount.

To avoid a collision an aircraft might do a number of things or combinations of them. They are: change speed, change heading, or change altitude. Both aircraft may act, or only one may act.

The prediction of an impending collision course largely hinges upon the measurement of azimuth. The Bendix analysis showed there is an upper bound to the time at which collision can be predicted by a self-contained system, in addition to the lower bound set by the time needed to escape.

• **The upper bound** is set by the need to determine azimuth with great accuracy. At a sufficiently great time (range) all aircraft would seem to be on collision courses if they are headed toward each other.

Bendix points out the case of "an extreme but familiar example of the vanishing derivatives of motion at long range as seen in the heavens. The 'fixed' stars are known in fact to be moving at

This "Big Stick" stops trouble before it starts

So powerful that it revises infantry strategy, the Douglas *Honest John* is an artillery rocket of tremendous destructive force and deadly accuracy.

Designed and built by Douglas Aircraft, Honest John moves into position on its own launching truck. This free-flight missile can carry the heaviest high explosive charge, or an atomic warhead in weather that grounds tactical air cover. Its very existence deters an enemy from massing for effective ground attack.

HONEST JOHN puts a mobile atomic weapon up front with the infantry

Development of Honest John by Douglas engineers fills a vital infantry need and provides new muscle for our armed forces. But the basic strength of any defense depends on the people manning it. Find out what an important future there is for *you* in U. S. Army service.

Depend on *DOUGLAS* **First in Aviation**

enormous velocities, and not on collision courses with the earth."

Severity of the azimuth demand is pronounced. Some idea of it is gained by noting a Bendix comment that the angle subtended by a DC-7 head-on at 10 miles, wing-tip to wing-tip is about 0.12 degree.

Time to Turn

All aircraft take time to maneuver. A warning that is too late for the maneuver is worthless. In the Bendix study the term "escape time" was used to define time which begins at the instant decision for action is taken. It does not include data gathering time.

Bendix took different escape maneuvers into account and based on certain "standard" maneuvers looked into the times required for escape. Included in escape time was reaction time. This includes human and vehicle reaction times.

Conclusions showed:

• The escape maneuver may be a turn out, turn parallel, or a turn across.

• Turn out appears preferable, since it requires substantially less time than other choices, and requires less information than other choices. In every case a "standard" maneuver requires at least 30 seconds escape time. No means exists for reducing minimum escape time of 30 seconds—neither cutting safety margins nor increasing maneuver severity will do it. It is nearly independent of airspeed.

• There is little choice between level and vertical turns. Greater displacement possible in the former is offset by greater data accuracy of the latter. Mere knowledge of the presence of a second aircraft, or of position only is of little use. Complete and accurate position and velocity data are required.

RTCA's operational requirements show the minimum cost proximity warning system should require a protected airspace having a radius 10 statute miles around the aircraft in a horizontal plane. In the vertical it should be 800 feet below and above flight level up to 30,000 feet mean sea level, and 1,600 feet below and above flight level when above 30,000 feet mean sea level.

• **Total time** between two 500 mph aircraft in a head-on course at a distance of 10 miles would be 36 seconds.

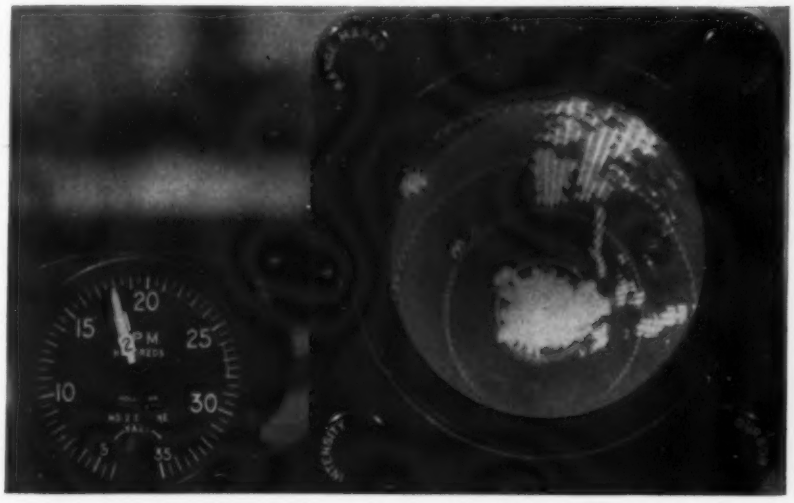
Brantley believes that a partial self-sufficient system might be used to take care of Mach 1 and faster aircraft. The extreme speeds of these aircraft would reduce time to escape for transport aircraft as compared to other avoidance situations. He has proposed that these military aircraft could carry a transponder which would effectively increase the range and perhaps the accuracy of transport carried self-sufficient systems.

An attractive prospect for the future of a satisfactory self-sufficient system has been pointed out by a number of the engineers working on collision warning devices.

• **If and when** such a system is produced operation of it in conjunction with simple ground beacons would be practically capable of taking over the entire management of air navigation, even including instrument landing systems and ground control approach radar.

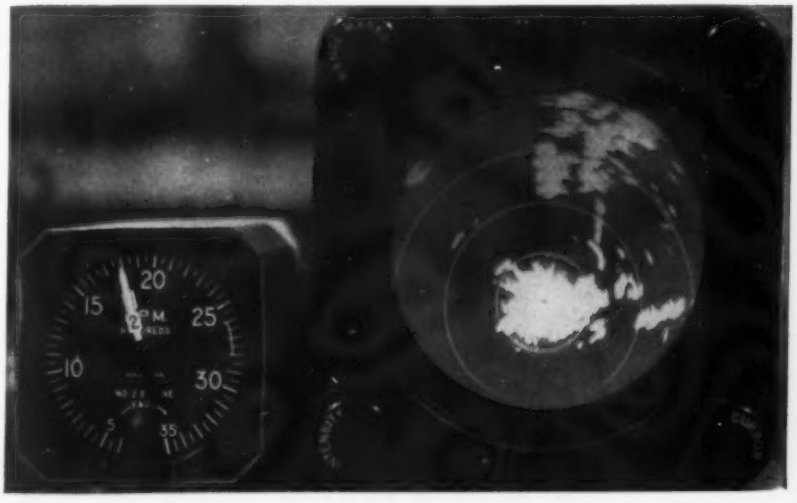
This sort of outlook sounds similar to the philosophy expressed by Dr. George E. Valley, Jr., associate director, Lincoln Laboratory, in discussing the development of the SAGE system. He said, "Many times as technology has advanced the modern improvement has not done better precisely the job which had been done before in some other way, but the job itself has been changed. We can compare the automobile with the horse. However, the course which technology took was quite a different one, and the services which the automobile furnishes us are nevertheless quite different." ◆◆◆

How to Prevent Tachometer Interference On Weather-Mapping Radar Scope



This is what airlines discovered happened to their weather-mapping radar display scopes after installations were made. Magnetic fields induced by rotating parts in tachometers adjacent to the scopes caused modulation of the distance marker circles and fuzziness of the storm center displays as shown in the upper picture.

A new three-layer shielding material developed by the Magnetic Shield Division, Perfection Mica Co., known as Ce-Netic-Fernetic, is shown wrapped around the tachometer in the lower picture. It eliminates the problem and has been adopted by United Airlines, Inc. on 69 planes. Collins Radio Co., and Bendix Radio, division Bendix Aviation Corp. also are reported planning use of the shielding material.



TWA and Delta Air Lines buy 40 new Convairs . . .

GENERAL ELECTRIC JET ENGINES

New plane to cruise at 609 mph, serve America on 200–3000 mile flights

If you are looking forward to the quiet, vibrationless luxury of commercial jet flight, Convair's new jet transport is a major step ahead for your travel future. World's fastest airliner, the Convair jet will be powered by four new General Electric jet engines. It will have a 609 mph cruising speed. Already ordered by Trans World Airlines and Delta Air Lines, it will cut many U.S. flight times in ***half*** —bringing, for example, Kansas City nearly two hours closer to Washington, Chicago just over two hours from Miami.

CONVAIR JET can fly from standard runways. The new jet transport is specifically designed to land and take off from the runways already standard in most major American cities. This feature is a result of the plane's powerful new General Electric CJ-805 engines. They produce more power per pound of weight than any commercial jet engines of comparable size.

SINCE 1941, when General Electric built America's first jet engine, the Company has provided the Armed Forces with more than 31,000 jet engines. Just in the past eight years, General Electric jets have flown over five billion miles, logged ten and one half million hours in such famous aircraft as the Boeing B-47 and the North American F-86 Sabre.

FARSIGHTED POLICIES of U.S. airlines, plus Convair's engineering to the "Nth" power and General Electric's jet engine experience, will bring many new benefits to America's air travelers. General Electric, as always, continues to play a leading role in our nation's new Jet Age. ***General Electric Company, Cincinnati 15, Ohio.***

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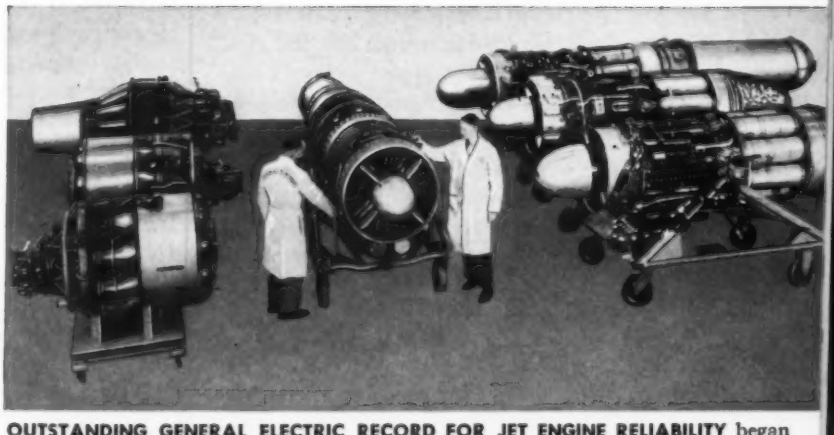
POWER WORLD'S FASTEST AIRLINER

NEW CONVAIRS will cut flying time up to 50%. Chicago–Miami in 2 hrs., 22 min.; San Francisco–Chicago, 3 hrs., 36 min.



OUTSTANDING GENERAL ELECTRIC RECORD FOR JET ENGINE RELIABILITY began with the I-A, America's first jet engine, and extends through the still-classified J79 (not shown). The G-E engine for new Convair jet is a commercial version of the J79.

Circle No. 18 on Reader Service Card.

New Purolator Separator Filters remove 99.95% of water and 99% of solids from Avgas and jet fuel

99 percent of all solids and 99.95% of the water can now be removed from both Avgas and Jet fuel by PurOlator's new Separator Filters. These new Separator Filters are rated – 300 gpm for Avgas; 225 gpm for JP-4, JP-5 kerosene, and 180 gpm for diesel fuel. The military model is Naval Engineering approved and its commercial facsimile performs with the same degree of efficiency.

PurOlator Separator Filters more than meet Naval requirements—water removal being 100%, dirt removal better than 99% with differential readings substantially below the maximum limitation of 15 psi—the effluent is clear and water-free.

The Commercial adaptation differs from its military counterpart in that its housing is made of steel with aluminum division plates whereas the Navy requires aluminum bronze throughout. These models can be mounted horizontally in the rear bucket box compartment of refuelers, on carts or in a stationary installation.

For full details, write PurOlator Products, Inc., Front and Linden Streets, Allentown, Pa., Dept. B4-82.

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

Circle No. 19 on Reader Service Card.

New Products and Processes

HELICOPTER BLADE TRACKER

Chicago Aerial Industries, Inc. has developed an electro-optical device that accurately measures the tracking position of any blade on a helicopter rotor on the ground or in the air.

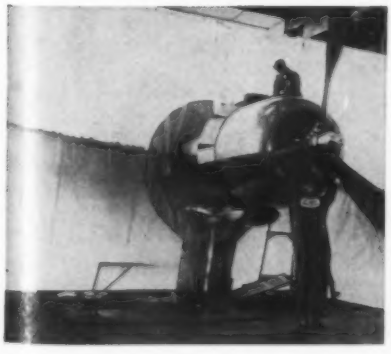
Formerly out-of-track blades were checked for rotation in the same plane by holding a piece of canvas against the rotating rotor tips and noting difference in height from the ground of the different lines formed on the canvas by the touching rotor blades.

The new device overcomes the necessity for a crew of four to check the blades and eliminates erratic readings induced by wind gusts and motion of the tracking stand.

Located two to 12 feet from the blades, the CAI blade tracker reads tracking to within ¼ inch and shows averages of many readings. It tracks at from 120 to 1,500 rpm. Instantaneous blade positions can be read on an oscilloscope during flght. The unit weighs 34 lbs. and requires no attachments to any of the blades.

Circle No. 156 on Reader Service Card.

PROTECTIVE COVERINGS



Herculite Protective Fabrics, Inc. has introduced a new fabric for tarpaulins and similar protective coverings that is said to combine translucency with high strength, low weight, weather resistance and other advantages.

The material is made of loose mesh weave Fortisan-36 (trade name for Celanese Corp. of America high-strength rayon) laminated between two outer vinyl coatings. Fortisan-36 is resistant to the sunlight degredation that attacks certain other fibers.

Pan American World Airways is using a Herculite curtain for protection against weather during engine overhaul work. Tarpaulins of the same material are suitable for wing and engine covers.

Circle No. 149 on Reader Service Card.

AVIATION OIL

Gulf Oil Corp. is planning to market a new detergent oil for all types of aircraft engines.

Series D is a blend of oils containing an anti-foam agent and a detergent dispersant effective for high and low temperature operation. Research men say it will not form combustion chamber deposits capable of causing pre-ignition. It is said to provide improved sealing between pistons, rings and cylinders, thereby keeping oil consumption low and power high.

The new Series D oil is suitable for radial engines as well as horizontally opposed engines. It is being manufactured in three viscosity grades, SAE 30, SAE 40 and SAE 50, corresponding to aviation grades 65, 80 and 100 respectively.

Circle No. 148 on Reader Service Card.

SWIVEL JOINT, RELIEF VALVE

Two new aircraft hydraulic system components introduced by **Arkwin Industries, Inc.** are a swivel joint and a relief valve.

The swivel utilizes a split bronze bushing, thereby eliminating the weight of a ball-bearing assembly. O-ring and Teflon back-up ring are fabricated within a split gland, which is said to facilitate maintenance and assembly. End fittings may be selected to suit requirements. Photo illustrates envelope size for ¼", 5/16" and ⅜" configurations.

With the relief valve, full flows in excess of 30 gpm may be operated with only 8-9% increase in inlet pressure from the dynamic cracking setting. Reseat pressure is less than 18% of full-flow pressure. Overall length is 5½". Suitable for temperatures ranging from —65°F to 275°F.

Circle No. 147 on Reader Service Card.

SMALL PARTS WASHER

An automatic machine for washing, rinsing and drying small parts that can process up to 40 baskets of parts per hour is offered by **Ransohoff, Inc.**

Trade-named the Ransomatic, the machine cleans two baskets or other loads of parts in one load, occupies only 10 sq. ft. of floor space. Maximum overall size of each basket is 21½" long, 14¾" wide and 14" high.

When baskets are loaded into the

A letter from Daddy

TO: VICTORIA D'AVI

Dearest Vicki:

You don't know it, but dangling near the windshield of my plane is a tiny shoe you wore as a baby, to remind me I'm the daddy of a gorgeous little girl—and to soothe my eyes after seeing my own big flat dogs beneath the panel. You've grown up but, thank gosh, all your expansion has been in the right places, and your tootsies still are neat and trim. Men prefer ladies with small, shapely feet, especially when displayed by an auburn-haired, brown-eyed Someone who's 18, 5'4½", and 114 lbs.

Southwest Airmotive—my favorite service station—is 25 years old but, unlike you, it has NEVER stopped growing. Now, SAC has:

1. Opened a Mid-West Division in Kansas City, Kans., to ditribute and service the products of the Eclipse Pioneer, Red Bank, Pioneer Central, Utica, and Pacific divisions of the Bendix Aviation Corp., and of the AC Spark Plug Division of GM, the Aeroquip Corp., and B. F. Goodrich Co.;
2. Opened a Rocky Mountain Division at Denver, Colo., as distributor for the Bendix Products and Bendix Pacific divisions, AC, Goodrich, and Aeroquip, and
3. Moved ahead with plans for its new $2,000,000 service and parts distribution facility at Love Field, Dallas.

Yessam, faith in the future is identified by Major Investments in the past and present. This always has been the case with Southwest Airmotive. Come to think of it, this also is true in the case of me and my Queen Victoria. I consider the faith of both of us—me and SAC—extremely well placed!

Love,

Daddy

SOUTHWEST AIRMOTIVE CO. • LOVE FIELD • DALLAS, TEXAS

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WORLD'S PREMIER AIRPLANE FABRIC

lighter — stronger — smoother

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Leading Manufacturers of Fabric and Tapes for the Aircraft Industry

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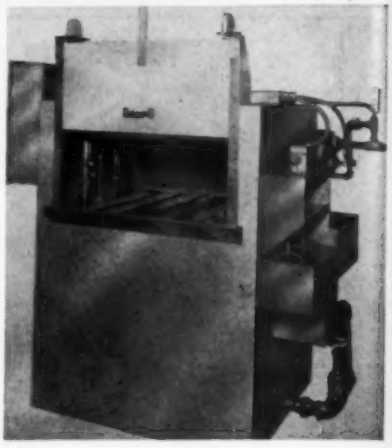
Circle No. 20 on Reader Service Card.

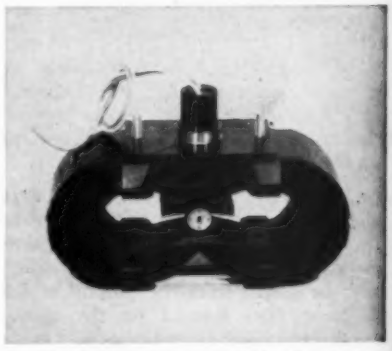
NEW PRODUCTS



cabinet, the door is closed and an automatic cleaning cycle is started in the following sequence: hot recirculated cleaning solution spray for 30 seconds; hot water rinse spray for 60 seconds and a drain-dry for 90 seconds. Times may be adjusted.

Circle No. 146 on Reader Service Card.

35 KMC MAGNETRON



A high-power, pulsed, fixed frequency magnetron, Type 6799, is offered by the Electronics Division of **Sylvania Electric Products Inc.**

The new tube for long-range radar operates in the 34,512- to 35,208-mc range with a peak power output of 100 kilowatts.

Circle No. 145 on Reader Service Card.

TEST CHAMBER

Mantec, Inc. offers a self-contained, multi-environment test chamber that produces temperatures ranging from -100°F to 400°F and automatically maintains accuracy during continuous operation within ±2°.

Designated Model D-102A, the unit is constructed entirely of steel. Its 12 cu. ft. stainless steel inner chamber is sealed to prevent moisture seepage into insulation. Temperature can be dropped to -65°F in 40 min. or raised to 400°F in 30 min.

Low temperatures are generated by

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. . . are fitted to over 100 Vickers Viscounts in airline operation.

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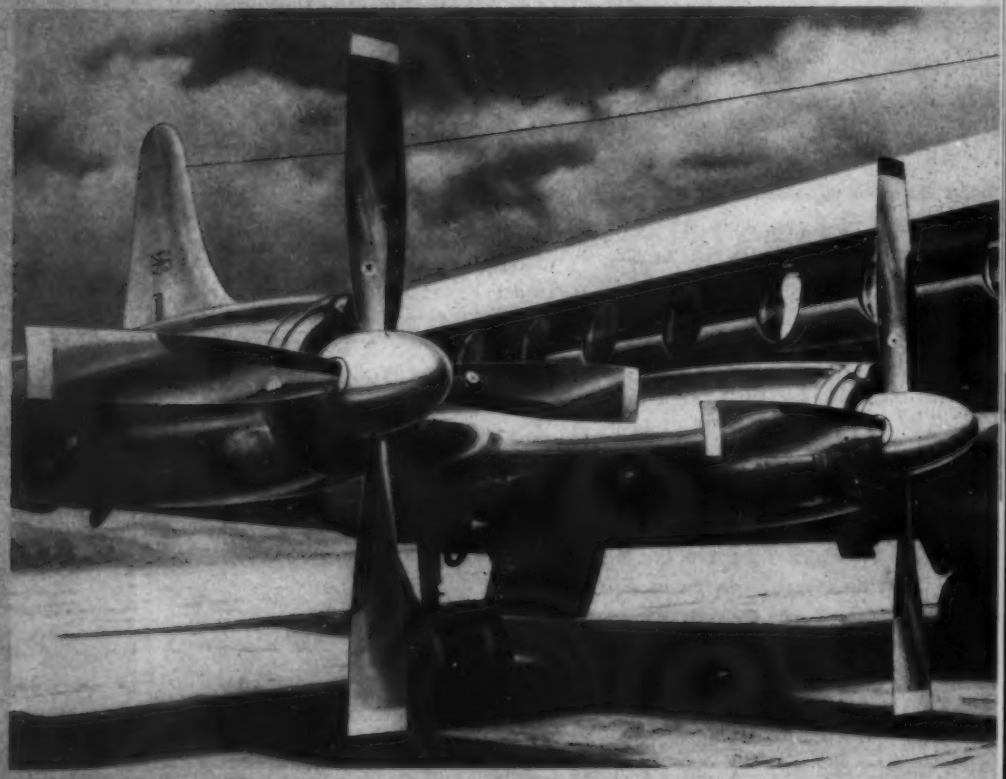

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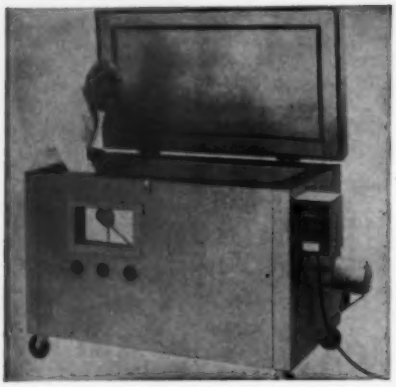
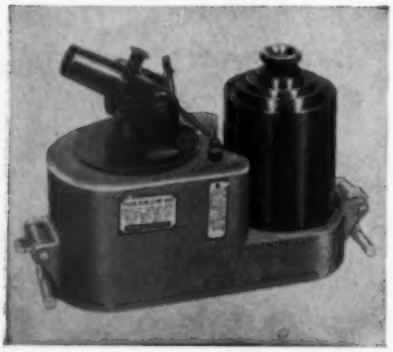
NEW PRODUCTS



dry ice in a special compartment. A motor-driven fan circulates air over the ice. Refrigerated air then passes though the working volume in a double convection system.

Circle No. 144 on Reader Service Card.

HYDRAULIC JACK



A 17-ton hydraulic jack designed for the U.S. Air Force by **Los Angeles Automotive Works** enables one man to lift a four-engined airliner.

From a base of 9 in., a telescopic cylinder raises to a height of 29 in. when fully extended. The jack weighs less than 100 lbs., yet is small enough to be carried in the trunk of a car or mounted on a wheel plate.

A safety device with a built-in relief valve prevents overloading and can be set to any predetermined pressure.

The manufacturer is seeking distributors.

Circle No. 143 on Reader Service Card.

VHF TRANSCEIVER

Dare, Inc. has announced a VHF aircraft communications transceiver for operation on 180 or 360 channels. Model DTR-18/36 has frequency coverage from 118.0 to 135.95 mc. For 180-channel operation, channels are spaced at 100 kc. for 360-channel operation, they are spaced every 50 kc.

The transceiver will operate as a simplex unit or can be supplied for cross-channel communications. The unit is built on a ½ ATR rack and weighs 22 lbs. Output is 15 watts rf, and is capable of 100 per cent modulation. Totals of 38 and 58 crystals are used for 180- or 360-channel operation respectively. Power is supplied by a dynamotor. Nineteen tubes and one germanium diode are used.

Circle No. 150 on Reader Service Card.

AUTOMATIC OXYGEN SYSTEM

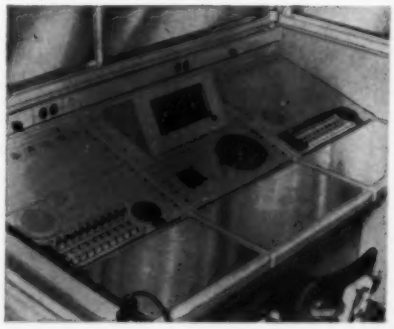
Zep Aero has developed a completely automatic high-altitude oxygen system for business and private aircraft that will accommodate up to five persons.

The manifold unit for the system measures 6″ by 6¾″ and mounts flush on the cabin header or wall. Each passenger plugs the mask fitting into the manifold in the cabin and oxygen is automatically supplied to him at a rate physiologically adequate for the altitude being flown.

The system is supplied in a compact, lightweight kit including cylinder, cylinder bracket, tubing, five masks and the manifold.

Circle No. 142 on Reader Service Card.

CONTROL TOWER CONSOLE



A new control tower console has been introduced by **Wickes Engineering and Construction Co.** Originally designed for military use, the console provides two interlocked operating positions with dual control of ten remote transmitters and ten remote receivers, plus

To the ENGINEER of high ability

Through the efforts of engineers The Garrett Corporation has become a leader in many outstanding aircraft component and system fields.

Among them are:

air-conditioning
pressurization
heat transfer
pneumatic valves and controls
electronic computers and controls
turbomachinery

The Garrett Corporation is also applying this engineering skill to the vitally important missile system fields, and has made important advances in prime engine development and in design of turbochargers and other industrial products.

Our engineers work on the very frontiers of present day scientific knowledge. We need your creative talents and offer you the opportunity to progress by making full use of your scientific ability. Positions are now open for aerodynamicists ... mechanical engineers ... mathematicians ... specialists in engineering mechanics ... electrical engineers ... electronics engineers. For further information regarding opportunities in the Los Angeles, Phoenix and New York areas, write today, including a resumé of your education and experience. Address Mr. G. D. Bradley

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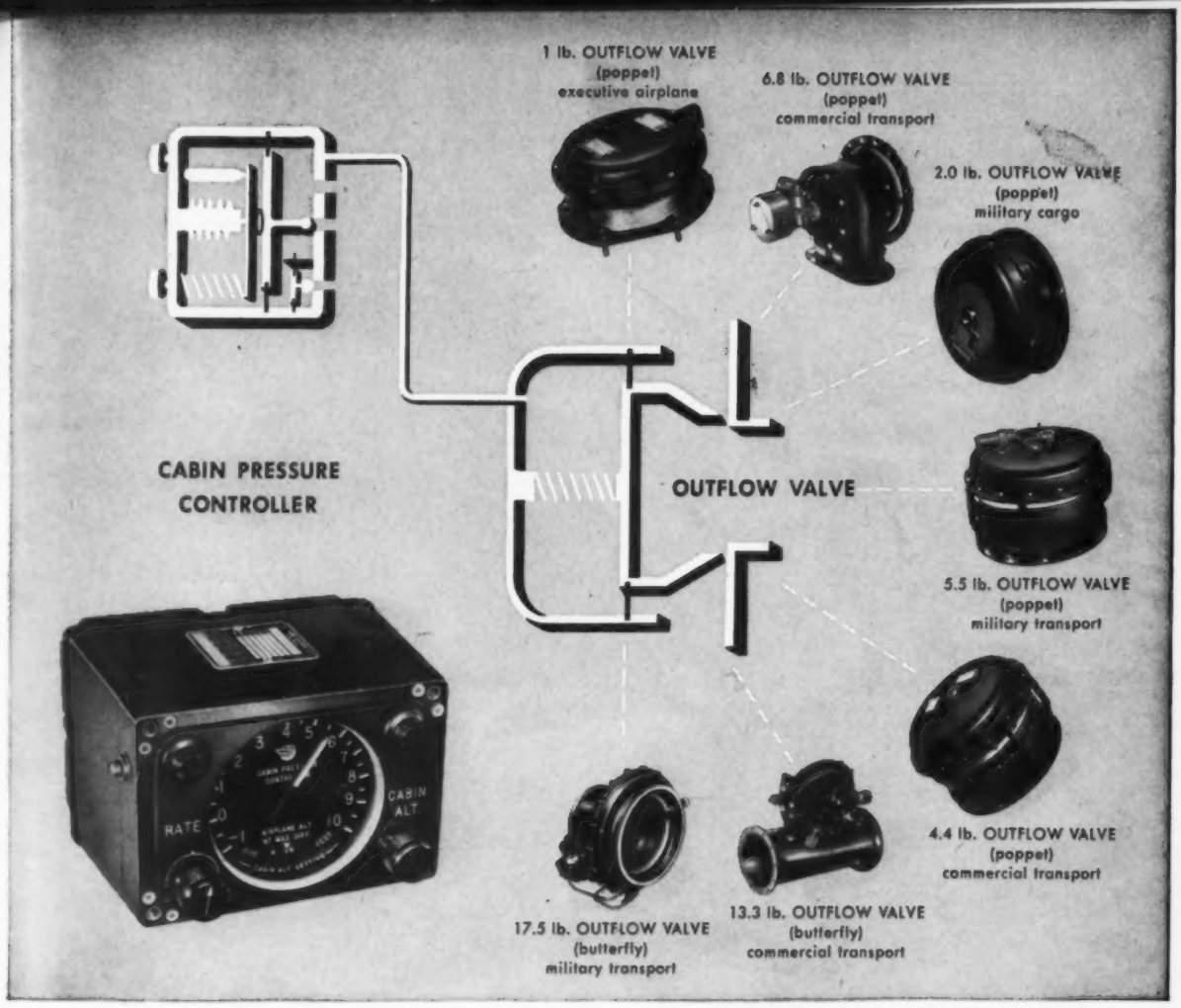

Two unit pressure control

FOR ALL SIZES OF AIRCRAFT CABINS

Simple, proved AiResearch pneumatic system operates independently...requires no outside power

The two elements of the complete AiResearch cabin pressure control system are a pneumatic controller and an associated outflow valve.

Only calibration is required to adapt the controller to various aircraft cabin pressure requirements. Minimum or no servicing is needed.

The outflow valve is a simple diaphragm and spring operated valve connected to the controller by a pneumatic line. It may also serve as a safety valve under emergency conditions.

An electrical or pneumatic override can be provided to give the pilot manual control whenever conditions warrant it.

This system is immediately available for all aircraft models. Your inquiry is invited.

Qualified engineers are needed now for unexcelled career opportunities. Write for information.

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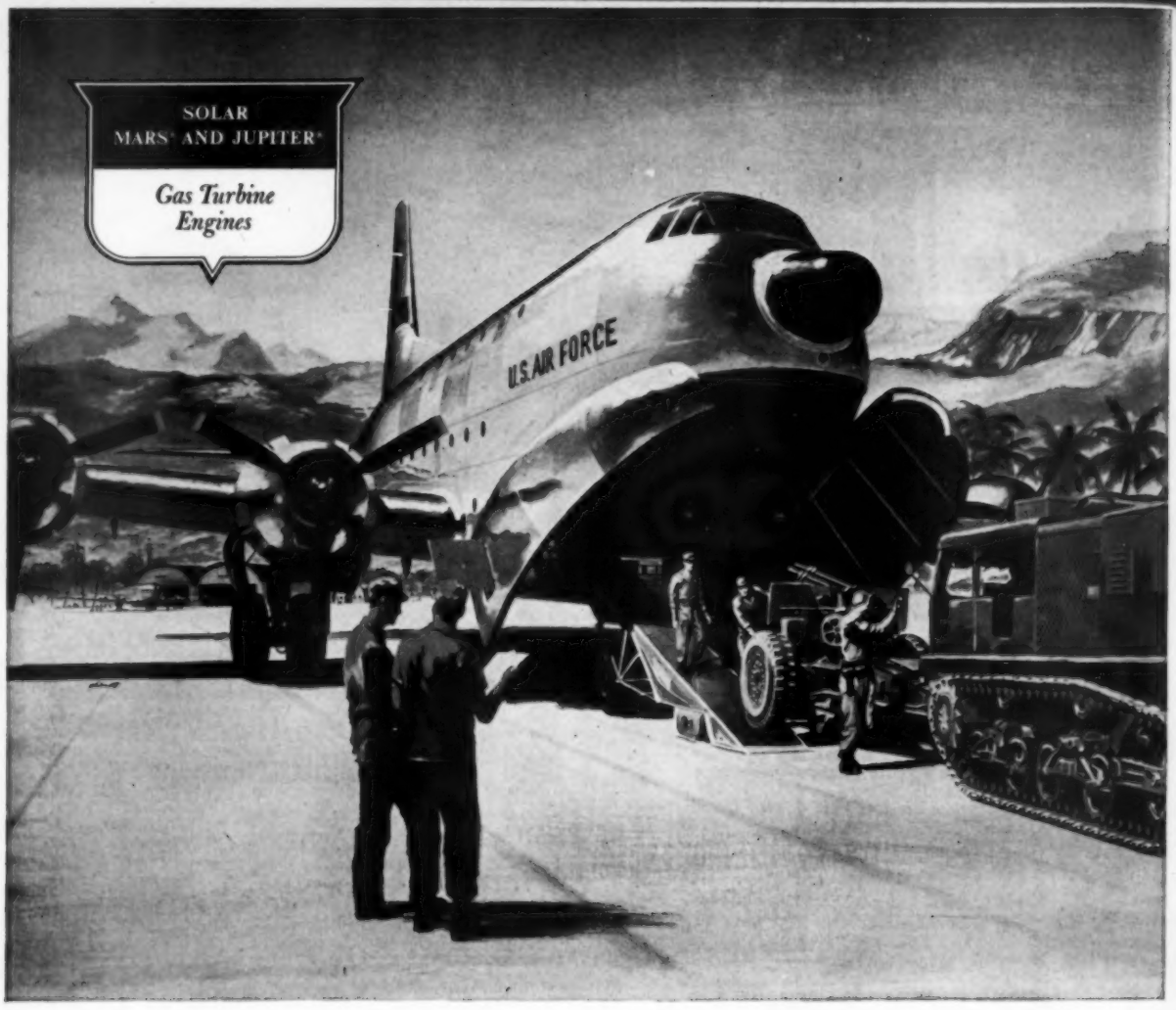

Tiny gas turbine provides vital power for giant air freighter

HUGE GLOBEMASTERS depend on Solar Mars gas turbines as a vital auxiliary power source. Built into an airborne generator, the Mars provides power to operate cargo winches, ramps, lights, engine starters and other equipment. Specified on the Douglas C-124C, the Mars unit is also used on the Lockheed C-121C, the Convair C-131B, and the Boeing KC-97.

Military services and aircraft builders recognize the amazing advantages of Solar gas turbines. Their reliability is proven. They are rugged and simple, light and compact, and easy to maintain. Solar builds two models—the 50 hp Mars and the 500 hp Jupiter—for varied applications.

You should know about Solar gas turbines. And you should know about Solar—a company with 30 years of experience in using tough alloys to solve tough engineering and fabricating problems. For more information, write Dept. C-59, Solar Aircraft Company, San Diego 12, California.

WRITE FOR BOOKLET...new brochure describes Solar gas turbines—how they work, advantages they offer to forward-looking industries. Send for a copy today.

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NEW PRODUCTS

control facilities for remote obstruction lights, field lighting, aerological instruments, siren and obstruction lights.

A built-in heater and air conditioner included in the console measures 6 ft. square and less than 7 ft. high.

Circle No. 150 on Reader Service Card.

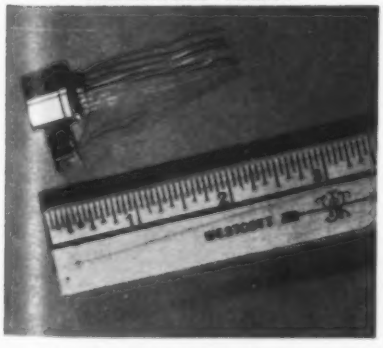
ROTARY INVERTERS

VARO Manufacturing Co. offers a complete line of precision-frequency rotary inverters for aircraft and missile applications. The inverters are designed to provide power where frequency accuracy is critical.

Inverter outputs from 250 to 3,500 volt-amperes are available. The units are rated to hold frequency output within 0.1 per cent of 400 cps under varying load and input voltage conditions. A precision tuning fork frequency standard is used to maintain close frequency regulation.

Circle No. 151 on Reader Service Card.

MINIATURE RELAY



Elgin National Watch Co. offers the Neomite relay, which it believes is the world's smallest switching device. Tests of prototype models of the relay have been run to more than 3,000,000 cycles without failure.

Samples of the relay are available with 50-, 200-, 500- and 1,000-ohm coils having 100 mw sensitivity. The Neomite weighs 1/16 ounce and measures ⅓" x ½". The company says units are being used in airborne fire control systems.

Circle No. 152 on Reader Service Card.

DUAL-TRACE PREAMPLIFIER

A new **Tektronix, Inc.** fast-rise dual-trace plug-in preamplifier is available. The Type 53/54C unit is interchangeable among all Type 530 and 540 oscilloscopes.

Characteristics are: 0.05 v/cm to 50 v/cm sensitivity, ac or dc, continuously variable, with nine calibrated steps. Frequency response is dc to 24 mc, and rise-time with Type 541 and 545 scopes is 0.015 micro-seconds; dc to 10 mc, and rise-time is 0.035 microsecond with 531 and 535 Types; dc to 5 mc, and rise-time of 0.07 miscrosecond with Type 532.

Circle No. 141 on Reader Service Card.

VIBRATION SHAKER

A new wide-band vibration shaker has been announced by **The Calidyne Co.** Designed for higher frequency vibration and lower input requirements, the Model 174 shaker features a system for random vibration testing of components and assemblies up to 30 lbs. in weight. Other features are collinear table motion, 9" table diameter, 130 lbs. load for 10g vector and 55 lbs. for 20g vector, maximum stroke of ± .5" with rec-

16 Passenger

Twin Pioneer

—can bring cheap air transport to any part of the world which can provide a hundred yards or so of reasonably level ground.

A fixed wing, 16-passenger or 4,000 lbs. freight carrying aircraft that can take-off in 85 yards and land in 90 yards. The Twin Pioneer cruises at 140 miles an hour . . . Range 620 miles . . . Maximum speed 180 miles per hour . . . and lands at bicycle speed.

The Twin Pioneer aircraft is specially designed to meet the need of difficult territories where airfields can neither be constructed nor afforded and for short range inter-city air services where much time can be saved by operating from strips close in to the centres of cities.

SCOTTISH AVIATION

PRESTWICK AIRPORT, AYRSHIRE, SCOTLAND • Telegrams: AERONAUTICS • PRESTWICK

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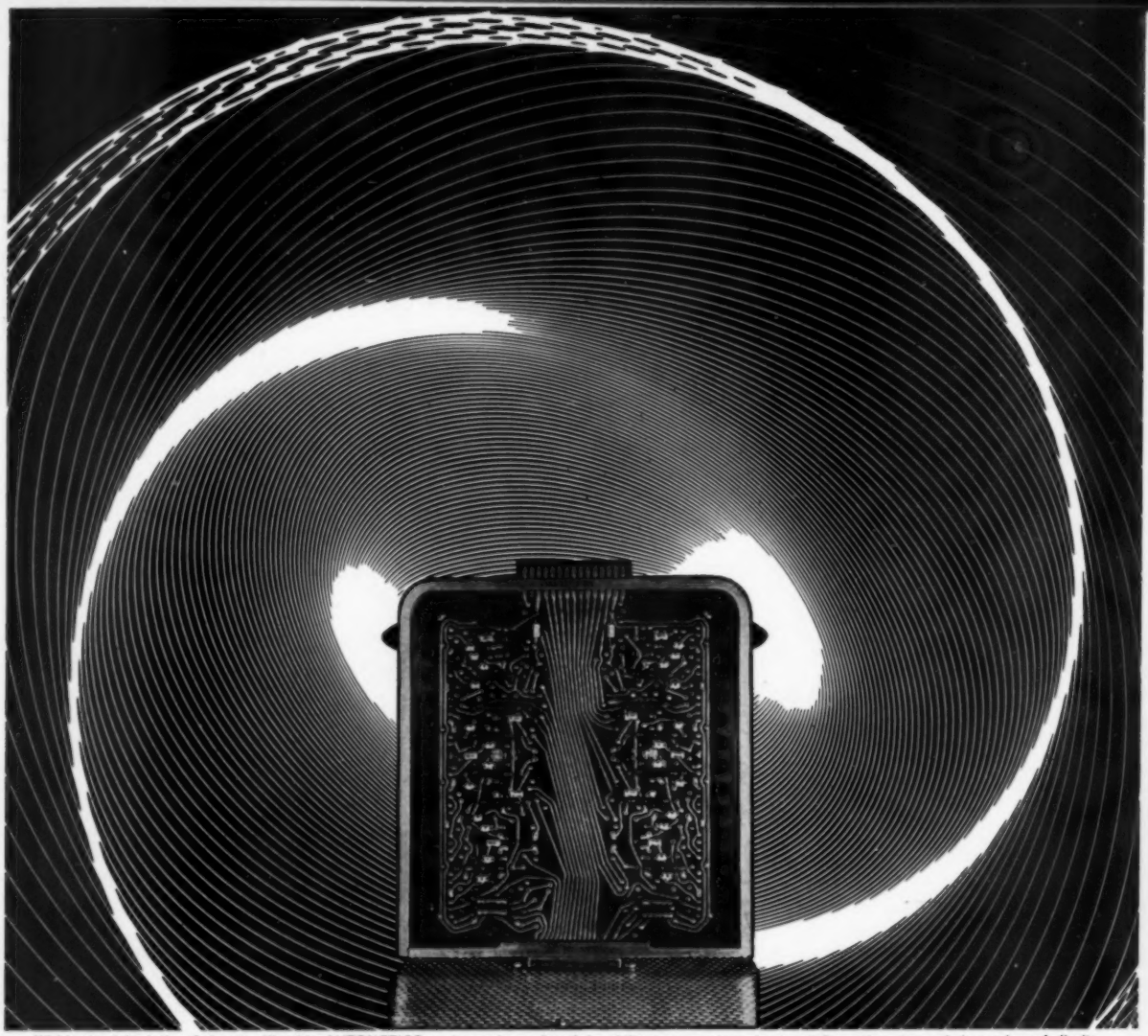

Within tiny labyrinths of circuitry like this, AUTONETICS engineers have placed the ability to compute and act on information at speeds beyond man's limits.

Why man needs an electronic intellect

to act faster than his brain can think

Not so long ago a slide rule, an adding machine, or a simple calculator were all that man needed to speed the application of his reasoning.

Today, because of the complexity and number of his problems—when the speed needed to solve them is beyond human limitations—he has had to create electronic servants that can compute, decide and act for him faster than his brain can think.

For 10 years the engineers at AUTONETICS—a Division of North American Aviation, Inc.—have been designing and developing these electro-mechanical stand-ins. Into them is built the power to interpret, translate, remember, and digest myriad data...at speeds and in quantities never before dreamed possible.

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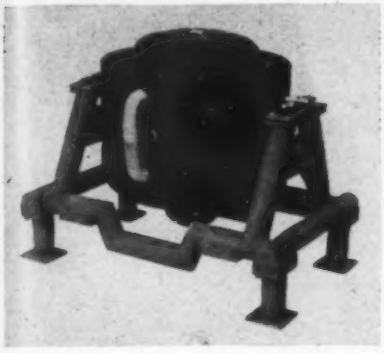
If you are interested in more detailed information—as an engineer or businessman—please write: AUTONETICS, Dept. A-5, 12214 Lakewood Blvd., Downey, California.

Engineers, write for details of challenging positions now open.

Autonetics

A DIVISION OF NORTH AMERICAN AVIATION, INC.

AUTOMATIC CONTROLS MAN HAS NEVER BUILT BEFORE



ommended stroke of ± .25" for continuous duty. Power required is 3 kw at 125 volts dc. Weight of the shaker is 2,000 lbs.

Circle No. 154 on Reader Service Card.

DC AMPLIFIER

A new dc amplifier has been announced by **Doelcam, division of Minneapolis-Honeywell.** Said to be particularly suited for airborne thermocouple or strain gauge measurements, output of the amplifier is 0 to 5 volts for input to an RDB telemetering system or magnetic tape recorder.

The amplifier has less than 5 milliseconds rise time and response from dc to 400 cps is said to be flat and suited to flight test applications where switches scan as many as 150 points a second.

Circle No. 155 on Reader Service Card.

TEST STAND

Greer Hydraulics, Inc. has developed a constant speed drive test stand that simulates actual flight conditions by duplicating, on an electronically controlled variable speed drive, variations in engine speed to test their effects on aircraft constant speed drives.

The machine also has been designed to maintain any set speed at a constant value within extremely close tolerances over the entire operating range of from 200 to 8,500 rpm. It contains two oil systems. One simulates the en-

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arms aircraft nerve systems to challenge the thermal barrier

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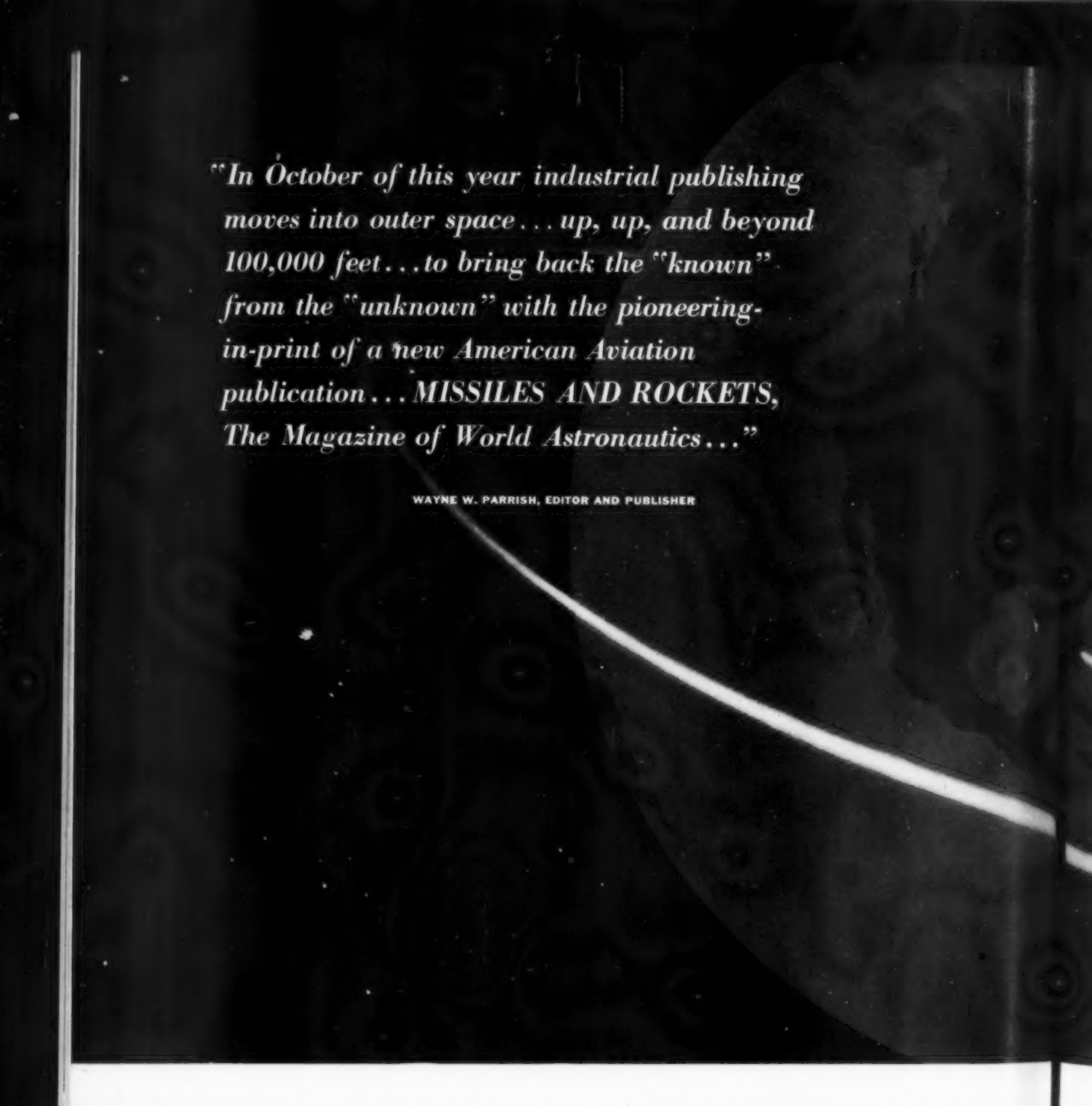
*Du Pont's Trade Name for POLYTETRAFLUOROETHYLENE


"In October of this year industrial publishing moves into outer space... up, up, and beyond 100,000 feet... to bring back the "known" from the "unknown" with the pioneering-in-print of a new American Aviation publication... MISSILES AND ROCKETS, The Magazine of World Astronautics..."
WAYNE W. PARRISH, EDITOR AND PUBLISHER

WE FACE A FORK in the road of the sky. Man's newest vehicles of flight move at "impossible" speed into an astral world that the day before today was dream stuff. And soon ... earth satellites. To us who have grown up with aviation, the call is clear for a new, independent publication ... personal to this field, its challenging problems, and its people.

OUR ANSWER... MISSILES AND ROCKETS

Now, for the first time, a magazine to serve as a forum for the fast exchange of ideas and information ... to answer the demanding needs of the scientist, engineer, management, the military. And, in the same breath, to open up a specialized market of impressive magnitude ... that in five short years has already climbed from a $21,000,000 investment to generously over $1,000,000,000 ... and has no place to stop!

The Magazine of World Astronautics is the not insignificant publishing sphere of MISSILES AND ROCKETS. It will carry an editorial content of high technical competency. It will focus on timely reporting of fact, leave formula-laden theses to other capable hands. Its editorial board will be the eminent authorities of this new science-industry, men of the stature of Dr. Wernher von Braun, Krafft Ehricke, R. P. Haviland, Alexander Satin, Frederick Durant, III.

AVIATION'S LARGEST EDITORIAL STAFF

Behind their professional guidance, our own news and technical specialists, as well as new journalists carefully sought out to augment what is already the largest staff in aviation — the editors of our Aviation Daily, American Aviation, our other news services and periodicals. So, too,

Courtesy—Minneapolis-Honeywell Regulator Co.

many months of painstaking planning to ready the crew. At this very moment, MISSILES AND ROCKETS editors and researchers are in the field, the plants and the proving grounds, lining up the selected content for the first issue.

LAUNCHING DATE IS OCTOBER, 1956

With its initial issue, MISSILES AND ROCKETS will provide an audience of above 13,000, a substantial and growing share of which will be paid, at $8.00 a year. Just as rapidly as it finds its natural acceptance, slowed down only by a deliberate policy of rigid subscriber selectivity, this circulation will be entirely paid and audited.

To any corporation with an already identified position in this field, this is an unparalleled standard of market coverage, quantitatively and qualitatively. To any newcomer whose policies call for new market exploration, this is a unique, one-magazine way to "find-out" at low cost. To all venturesome advertisers, our doors are wide open. A special charter advertising rate has been set up for your use of the first three issues (October, November, December) of MISSILES AND ROCKETS...so we suggest you call our nearest representative, reverse the charges, and reserve your space.

MISSILES AND ROCKETS

The Magazine of World Astronautics

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NEW PRODUCTS

gine's oil reservoir for gearbox lubrication. The other is used for fluid power and lubrication of the constant speed transmission.

Optional accessories are available. Technical specifications may be obtained on request.

Circle No. 157 on Reader Service Card.

HI-TEMPERATURE POTS

Fairchild Controls Corp., Components Division has developed a line of high-temperature potentiometers designed for operation from —55° C to 225° C. The new line includes wirewound potentiometers in single and multi-turn types rated for continuous operation at 125° C up to 4 watts. Other units of rotary type are rated at 225° C.

Load life at high temperatures is rated in excess of 500 hours and rotational life up to 500,000 cycles.

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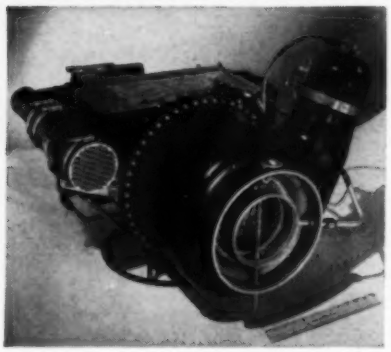
GAS TURBINE POWER UNIT



A small gas turbine power unit for driving airborne or ground-support ac or dc generators, liquid pumps and alternators has been developed by **The Garrett Corp.** AiResearch Manufacturing Division.

Model GTP70-10 has a 100 hp rating, weighs 175 lbs. and is compact enough to be carried in a duffel bag. It provides a source of constant-speed shaft power at altitudes up to 50,000 ft. and will operate at temperatures ranging from —65°F to 130°F.

The unit has completed a 200-hour test run at the Naval Aircraft Engineering Laboratory in Philadelphia. AiResearch says its life has been extended to a 1,000-hour overhaul period.

Circle No. 158 on Reader Service Card.

Product Briefs

• **Robinson Aviation, Inc.** transit mounts are designed for the protection of delicate equipment against shock and vibration either in transit or in storage. They use elements of resilient Met-L-Flex stainless steel and fit almost any type of reusable container in general use. Models 1161 and 808 have attenuated shock impulses as great as 35g.

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• **Webber Engineering Corp.** has introduced a rivet cooler that holds 25 aluminum canisters with perforated bottoms in the cadmium-plated rack of the storage compartment. Each canister holds 1 lb. of 17 S.T. or 24 S.T. aluminum rivets. Rivet compartment measures 11½" long x 11½" wide x 12½" high.

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for every electrical circuit

These electrical connectors are designed and built to provide maximum performance under the most rugged operating conditions.

Well recognized for outstanding characteristics of resistance to moisture and vibration, these connectors are provided in a variety of AN types.

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Bonanza Air Lines—TWA interline partner—
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A salute to Bonanza Air Lines . . . celebrating its 10th anniversary this month . . . starting its 11th year of service to travelers in the far West! For a decade, TWA passengers have made connections at Los Angeles, Phoenix and Las Vegas. Boarded swift, comfortable Bonanza flights to 16 cities in California, Arizona and Nevada.

Bonanza is one of TWA's important interline associates. It provides convenient, dependable DC-3 service throughout the heart of America's scenic desert country. TWA congratulates Bonanza Air Lines on its 10th successful year of operation . . . and on its outstanding record of accomplishment in serving the traveling public.

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Bendix AVIATION CORPORATION

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People

MANUFACTURING

Arnold Johnson appointed senior vp and **Fred Godfrey**, vp-manufacturing for Weber Aircraft Corp.

Johnson

J. E. Rheim elected president and gen. mgr. of Rohr Aircraft Corp.

Allan S. Robertson appointed vp-sales of Fenwal Inc.

Matthew Lyon named gen. sales mgr. for Breeze Corporations, Inc.

Bernard E. Oldfield joined Hughes Aircraft Co.'s research and development laboratories as research physicist.

Frank L. Moncher appointed chief engineer-airborne products for Vickers Inc.

Oscar E. Holt made mgr. of the W. L. Maxson Corp. plant at Old Forge, Pa.

Walker G. Dollmeyer named vp-operations of Solar Aircraft Co.

Maj. Gen. Francis H. Lanahan (U.S.A., ret.) elected exec. vp of Federal Electric Corp., subsidiary of International Telephone and Telegraph Corp.

Dollmeyer

Lanahan

Wesley E. Magnuson named mgr. of the Convair-Fort Worth resident office at San Diego.

George A. Crowther made chief engineer of Ford Instrument Co., Div. of Sperry Rand Corp.

Capt. H. T. Dietrich (U.S.N., ret.) became asst. to the president of Kaman Aircraft Corp.

David H. Kollock appointed gen. sales mgr. of Airdesign, Inc.

Lloyd E. Frisbee named chief research development engineer for the Lockheed Georgia division.

Harold Bartel made principal engineer, production control dept. of Grand Central Rocket Co.

Herb De Cenzo as chief engineer heads On Mark Engineering Co.'s new aircraft couplings division.

Hooker Stoughton appointed mgr. of the aircraft fastener section of Scovill Mfg. Co.'s closure division.

Norman Warren, dir. of advertising and public relations, elected a vice president of Lear, Inc.

Warren

Arthur E. Hafstad named administration mgr. of Lockheed Aircraft Service-International; **Walter J. Currie** made Washington representative.

Carlton Shamo appointed supervisor of publicity for Dodge Mfg. Corp.

Walter R. McLachlan named president and gen. mgr. of Orenda Engines Ltd.

Robert J. Lang made asst. to the president of Aircraft Engineering & Maintenance.

K. M. (Bud) Barnes heads Hardman Tool and Engineering Co.'s new flight safety accessory division.

Dr. Arthur T. Biehl and **Robert Mainhart** appointed technical director and gen. mgr., respectively, of Aerojet-General Corp.'s new nucleonics division.

James T. Dresher named treasurer of Hiller Helicopters.

AIRLINE

Samuel C. Dunlap elected vp-cargo for American Airlines, Inc.; **Joseph V.** Dooley promoted to asst. vp. operations.

Dunlap

Capt. Carlos Torres de Navarra appointed vp and technical advisor of Cubana de Aviacion (Cubana Airlines); **Capt. D. F. Robbins**, acting technical advisor, was called back to PAA for reassignment.

Robert J. Longwell appointed comptroller of Mohawk Airlines.

Russ Kruse named mgr. of sales and promotion for Northwest Orient Airlines.

Capt. Peter C. Fair appointed gen. mgr. of Bahamas Airways Ltd., associate of British Overseas Airways Corp.

Frederick C. Flynn named southwestern district sales mgr. of United Air Lines, with offices in Dallas; **K. C. Jones** named director of public relations for the company.

Lt. Col. M. A. P. Mostert replaces **Capt. Malin Sorsbie** (retired) as gen. mgr. of East African Airways.

Edward J. Murphy appointed agency mgr. for KLM Royal Dutch Airlines in the U.S., succeeding **Shaun Mahoney** (retiring); **Frank O. Muni** made mgr. of special promotions.

William B. Leonard elected vp-sales for Transocean Air Lines.

Alex Jones named advertising mgr. for British Overseas Airways Corp.

GOVERNMENT

Edward C. Sweeney named general counsel of the General Services Administration.

Roy Keeley becomes deputy to division chief Ward Masden of CAA's Air Carrier Safety Division; **H. Turnpaugh** named chief of the air carrier maintenance branch.

HONORS

Col. Horace A. Hanes, Air Research and Development Command, will receive the Mackay Trophy for 1955 for the most meritorious flight of the year.

George Franklin Smith named for the biennial award of the Flying Tiger Pilot Trophy for his supersonic bail-out from an F-100.

John T. Griffin awarded a presentation by the Air Force Association "in recognition of (his) contribution to American Air Power."

Charles B. Sheckells elected national chairman of the National Aircraft Stardards Committee of the Aircraft Industries Assn.

NEMS-CLARKE
TYPE 1501

Special Purpose
RECEIVER
for
UNEQUALED
PERFORMANCE
in

- TELEMETERING
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- RADIOSONDE RECEPTION

The Type 1501 Special Purpose Receiver is now being offered as the improved version of the NEMS-CLARKE 167-J1 and 167-J2. The all new 1501 receiver incorporates the best qualities of both of the former types plus many new features including a BFO. A video bandwidth control is provided to greatly improve signal-to-noise ratio when full bandwidth is not needed.

NEMS-CLARKE Type 1501 receiver is useful in application in telemetering, guided missile monitoring, radiosonde reception and as a high quality general purpose laboratory AM/FM receiver where superior performance is desired in the frequency range of 55–260 mcs.

Write Dept. H-9 for further information

NEMS-CLARKE
Incorporated
PRECISION ELECTRONIC INSTRUMENTS
SILVER SPRING, MARYLAND

Circle No. 29 on Reader Service Card.

Another kind of INSURANCE

Ralph D. Ritchie was selling life insurance in Panama City, Fla., when the U. S. Army recalled him from reserve status as an enlisted man at the outbreak of the Korean conflict.

In 1952, he received a direct commission in the Army's Medical Service Branch and orders which sent him to helicopter flight school.

Today, Lt. Ritchie is helping provide a new kind of insurance . . . a strong and versatile aviation unit of the Army.

With more than 1200 hours of helicopter flight time, mostly in Bell H-13s, Lt. Ritchie is now an instructor at the Army Aviation Center, Fort Rucker, Ala. Here, he is teaching seasoned pilots and aviation cadets helicopter tactics that apply directly to the Medical Service Branch.

LT. RALPH D. RITCHIE
"an assist to the medics"

The Army is giving increasingly more responsibilities to its helicopter pilots. It is teaching these men to evacuate wounded, speed plasma and other supplies directly to where they are critically needed, fly in doctors, nurses and medical corpsmen. Helicopter pilots are doing dozens of different jobs for the Army . . . and doing them all well.

Helicopters need pilots and mechanics!
Apply to Army Aviation for career training!

Circle No. 30 on Reader Service Card.

BELL Aircraft CORP.

TEXAS DIVISION
P. O. BOX 482
FT. WORTH, TEXAS

West Coast Talk . . . By Fred S. Hunter

- **Boeing 707-320 sets airport pattern for jets.**
- **Has noise problem been exaggerated?**

AIRPORTS are going to have to come up with more ramp space for jet transports. Boeing's 707-320 will set the pattern for the big terminal airports like Los Angeles International. This is the intercontinental version of the Boeing entry and it will need 230 feet to circle. Compare this with the 150 feet presently available at the Los Angeles field. The domestic Boeing, the 707-120, will circle in 202 feet. The Boeing 707 sets these standards since Douglas is castering the rear wheels of the landing gear on the DC-8 and this means the forthcoming queen of Santa Monica will circle in any space big enough to accommodate its Seattle rival.

Hunter

• • •

Now that they've witnessed the Boeing 707 prototype in operation on their own field, Los Angeles International Airport executives have decided jet transports aren't going to be so great a problem for airport managements after all. The L.A. airport people liked the way the Boeing prototype handled in landing, takeoff, taxiing, etc., and they were very favorably impressed by the moderate takeoff and climb noise levels. "Less noisy than a short-stacked Connie," gleefully reported the young lady in charge of receiving complaints from the neighbors after lending an attentive ear to the sounds that emitted from the 707's tailpipes as it took out over the sand banks of Playa del Rey for the flight home to Seattle.

• • •

One result of the Boeing flight to L.A. will be an early decision to lengthen the airport's runways to 10,000 feet. A. M. (Tex) Johnson, Boeing chief of flight test, said that on a hot day the intercontinental version of the 707 would require 9,500 feet to take off with full payload. Temperatures seldom run very high at the Los Angeles airport, but space for extension of the runways happens to be available and it will be good business to eliminate all possibility of penalizing a payload to compensate for a galloping thermometer. Humidity, which will affect piston engines, doesn't matter because it has almost no effect on jet engines.

• • •

Tommy Tucker, chief engineer for Los Angeles International, makes a suggestion to jet transport manufacturers. This is to make No. 4 the starter engine, not one of the inboards. This would permit the airlines to establish a 4, 3, 2, 1 starting sequence in which the engine farthest out from the passenger gate would be the first engine started and the one nearest the gate the last engine started. Sounds like a sensible idea.

• • •

Douglas Aircraft Co.'s tremendous DC-6/7 sales volume is a big help in paying the development costs of the jet DC-8. If it weren't for these revenues from the sale of new piston planes, Douglas would have to be borrowing more money from the banks. In the first half of this year, Douglas wrote off almost $10,000,000 in development costs and most of this amount was for the DC-8. Interest on $10,000,000, for, say three years, comes to a tidy sum.

• • •

American Airlines may surprise the industry with a new interior concept in the Lockheed Electra. Provides a "club" type atmosphere, but at the same time helps better the seat-mile costs by interspersing some three-abreast seating in the package. Designer is Gil Mason, who helped fashion the interior of the Douglas DC-6 and is now design consultant to C. R. Smith.

• • •

CAA's 4th Region is doubling its efforts to recruit airways operations specialists and electronics specialists, two fields in which the need is reaching the critical stage . . . Douglas is scheduling completion of its new DC-8 final assembly building now under construction at Long Beach for February, 1957 . . . Luke Harris is now in the Douglas service department . . .

Midship lounge in Pan American's DC-7Cs weighs only 200 pounds and is removable . . . Hawaii-Tahiti Air Cruises in Honolulu offers—of all things—all-male charter parties in DC-4s to Tahiti.

Cap'n Sharp says: *"you fellers who can't balance cups or charts on your knees, can use one of these."*

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International Aviation

By Anthony Vandyk

"It must be the spark plugs," Mr. W remarked after taking a long look at the engine of the immobile Rolls-Royce. The connection between aviation and this 1933 vintage taxi broken down near Harrogate, England, needs some explaining. The explanation points up how domestic air transport in Britain is still far from being economic.

Mr. W and I were the only two passengers enterprising (or foolhardy?) enough to try to fly on the scheduled service of BKS Air Transport from London to West Hartlepool, a distance approximately equal to that between New York and Washington or London and Paris. The round-trip fare of $24 was not out of line in view of the saving of time compared with the railroad journey (West Hartlepool is off the main line).

About 25 passengers boarded the DC-3 at London Airport, but all except Mr. W and myself were booked to Leeds, the only scheduled stop on the service. Right on time the door was shut but the right engine persistently refused to start. After a few minutes the passengers were sent back to the waiting room and BEA was called to assist. After about an hour it was decided to bring a spare aircraft from BKS' base at Southend.

• **Eventually** we got away in the relief DC-3 three hours late and headed north. An hour later, when we should have been approaching Leeds, we were informed that the weather both there and at West Hartlepool precluded a landing. We were going to try to get into an RAF base, Dishforth, however. This attempt was unsuccessful and the next word was that we were heading back for London.

Half an hour after this we were informed that the weather was probably all right at Manchester so we were going to try to get in there. In due course we landed. It was well past midnight and the only thing on the minds of passengers and crew alike was sleep. BKS did us well—they put us up at Manchester's best hotel and gave us breakfast at the airport the following morning. The weather had improved and we made the 20-minute flight to Leeds without incident. At Leeds BKS had better things to do with the DC-3 than fly Mr. W and me to West Hartlepool.

They had made provision for us, however, and when we stepped off the aircraft a Rolls-Royce taxi was waiting to take us on. Eventually, after an hour's "mechanical" near Harrogate, we arrived at our destination having taken three times as long as the train!

P. S. It *was* the spark plugs, the garage man said.

U.K. Exports May Reach $280 Million

Britain's aircraft industry exports this year are likely to total at least $280 million, E. C. Bowyer, director of the Society of British Aircraft Constructors, told AMERICAN AVIATION in an exclusive interview. The 1956 total was $185 million.

Since the war, Britain has exported $1.3 billion worth of aviation products to more than 70 countries.

While military aircraft still represent the bulk of exports civil types are assuming increasing importance, Bowyer pointed out. The Vickers Viscount has been Britain's higgest civil aircraft export success. To date, Viscount export orders total some $200 million (plus 15% for spares).

Bowyer regards exports as "a healthy challenge to the industry." He sees civil exports becoming of increasing importance as the industry gets further into guided missile production. "It is difficult to visualize large export sales of missiles in the way that we are currently selling piloted military aircraft overseas," he observed.

• **Although** the British industry is continuing to expand—the labor force is going up by 1,000 a month at the present time—Bowyer reports that it is bothered by the present low profit margins on government contracts.

"There's not enough profit to replace factory equipment as fast as we would like," he says. "We think that the profit rate has been cut much too fine. It doesn't let us indulge in much capital expenditure," he said.

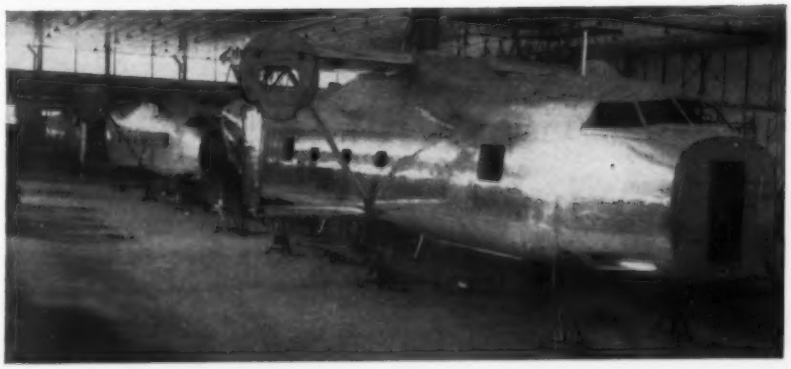
The SBAC director warned that examination of the balance sheets of individual companies gives a false idea of the state of the industry's financial health. He pointed out, as an example, that about half of the Hawker Siddeley group's profits comes from Canadian member companies.

• **Bowyer sees no need** to change the structure of the British aircraft industry by consolidations and mergers, as has been suggested in some quarters. He considers that basically, in its present form, the industry is well able to meet the future needs of civil and military customers.

He points out that there is "a tremendous amount" of subcontracting at the present time. If there is a recession, it would be logical to call in these subcontracts, he declared.

Discussing the forthcoming visit of certain Russian aircraft industrialists and designers to Britain in September, Bowyer pointed out that SBAC invited them to the Farnborough show at the request of the British government. "It was contrary to our usual practice to do so," he added, "since we are not allowed by the government to do business with the Russians." He explained that "our policy is to invite to Farnborough only people of nations with whom we can do business."

HD 34 Fuselages Prepared for Assembly



France's Hurel Dubois company will deliver the first of 10 HD 34 survey aircraft to the French National Geographical Institute next February. HD 34 fuselages are shown in Hurel Dubois plant. Apart from retractable nosewheel and large, transparent nose, the HD 34 differs little from the HD 32 "DC-3 replacement." Flying hours on the HD 31 and the two HD 32s now total more than 1,200.

Front view of Cessna's Model 620 four-engined executive transport

BUSINESS FLYING

Cessna Begins Taxi Tests on 620, Four-engined Executive Transport

Cessna Aircraft has begun taxi tests on the prototype Model 620 four-engine executive transport heralding start of the flight test program, Dwane L. Wallace, president, has announced. The 620 has been in development for three years. Operational tests climaxed a year of extensive static tests.

Just prior to the rollout, Cessna completed pressurization, air-conditioning and flutter tests, as well as 500 cycles of operation on the landing gear. Familiarization and functional tests along with cockpit tests were being continued.

Wallace has set Oct. 1 as the probable date for announcing production plans and delivery dates. He said the company now is in the process of determining cost and production schedules "if the airplane meets expected performance, and the project appears feasible."

• **Windtunnel tests** indicate the transport will cruise at 235 mph with 70% power at 18,000 feet with a top speed of 269 mph at 15,000 feet. Take-off gross weight is 13,650 lbs., and landing gross 13,000 lbs. The 620 is powered by four Continental GSO-526-A engines each developing 320 hp on takeoff and 290 hp METO. Maximum rate of climb has been pegged at 1,600 ft./min., with takeoff distance 1,800 ft. Landing distance is expected to be 2,250 ft.

Maximum range will be 1,700 miles, or about 1,550 with a one hour reserve. Four-engine service ceiling will be 27,500 ft. at gross and three-engine ceiling 22,500 ft.; 535-gallon fuel capacity is provided in wing-tip tanks and bladder-type fuel cells in the outer wing panel.

A gas turbine powerplant located aft of the fuselage eliminates need for outside power source. It also provides air conditioning, forced ventilation, heating, electrical power and pressurization.

Passenger cabin is completely separated from the pilot's compartment. It contains galley, lavoratory and walk-in pressurized baggage compartment.

Plane specifications: wheel base, 12.7 ft.; tread, 18.3 ft.; wing loading, 40.1 lbs./sq. ft.; power loading 10.6 lbs./hp.; span, 55 ft.; length, 41½ ft.; height, 16½ ft.; fuselage width, 74 in.; and fuselage height, 84 in.

Cessna's Ralph Harmon is chief engineer for the 620 project. ◆◆◆

Three-quarter view of 620 prototype on taxi strip.

Piper Owners Find Flying Helps Business

According to Piper Aircraft Co.'s annual survey, 88% of Tri-Pacer and 54.5% of Apache owners reported business expansion directly attributable to use of aircraft.

Tri-Pacer owners by occupation were listed as follows: manufacturers 19.5%; ranchers and farmers, 10.3%; doctors, 9.1%; airport operators, 9.1%; contractors, 7.9%; wholesalers, 5.5%; real estate and insurance men, 3.9%; retail store operators, 3.6%; automobile dealers, 3.6%; salesmen, 3.5%; engineers, 3.3%; oil field workers, 2.1%; missionaries and other church workers, 1.8%. Remaining 16.8% of Tri-Pacer users represented diversified groups, including business and professional men, government agencies, flying clubs, sportsmen, housewives, etc.

Percentage of Apache owners by occupation were found to be: manufacturers and executives, 36.2%; contractors, 13%; oil field workers, 8.7%; real estate and insurance firms, 5.8%; business distributors, 4.3%; lumbermen, 2.9%; advertising agencies, 2.9%; airport operators, 1.5%; dairymen, 1.5%; doctors, 1.4%. Another 11.8% were in a miscellaneous grouping.

About 41% of Apache fliers are private pilots and 59% commercial license holders. The average Apache pilot flies his plane an average of 505 hours a year. Most Tri-Pacer pilots are businessmen and private pilots. The average pilot flies his Tri-Pacer an average of 317 hours per year.

AIRBORNE FINGERPRINTS

—new air traffic safety by Stewart-Warner Electronics

Now, the new Stewart-Warner Electronics Airborne Safety Beacon makes it possible for every plane in the air to carry identification as positive as your own fingerprints. Stewart-Warner Electronics, the pioneer and builder of the first airborne safety beacons, which were tested by the Air Navigation Development Board and CAA, now offers airline and other aircraft owners automatic identification for greater air traffic safety.

The new beacon combines all the reliability and long-life factors of airborne military equipment supplied by Stewart-Warner Electronics to the services since 1942. This rugged equipment incorporates ARINC tubes and is designed to meet specifically characteristics No. 532-A.

CAA is now planning to install interrogators on ASR radar at all major air terminals to improve air safety. Be sure you take advantage of this program by installing an S-W Electronics Air Safety Beacon. Write today for full details from our Civil Aviation Department 12. Stewart-Warner Electronics, 1300 North Kostner Avenue, Chicago 51, Illinois.

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Lightplane Deliveries Rise Sharply in '56

Seven lightplane manufacturers report a total increase of 44% in number of units delivered and 50% in dollar value for the first six months of 1956 over the same period in 1955. AIA's Utility Airplane Council reported total six-month shipments of 3,579 aircraft at a dollar value of $53,979,000. In 1955, 2,474 airplanes were delivered at a value of $36,148,000.

Leading in total number of aircraft shipped and dollar value is the Cessna Aircraft Co., which delivered 1,776 airplanes at $20,901,000. Piper Aircraft Co. was second in units delivered with 1,273, while Beech placed second in dollar value with net billing price of $15,438.

Breakdown by company for units and dollar value in the first six months of 1956 is as follows:

Aero Design	Units	Total $ Value (000)
Model 560A	33	
Model 680	30	
TOTAL	63	$4,829
Beech		
Bonanza	271	
Model D18S	6	
E18S	53	
Twin Bonanza	67	
Model 45	5	
TOTAL	402	15,438
Call Air—Model A4	9	50
Cessna		
170B	65	
172	754	
180	341	
182	485	
195B	5	
310	124	
325	2	
TOTAL	1776	$20,901
Mooney		
Model M18C	7	
Mark 20	32	
TOTAL	39	343
Piper		
Super Club	396	
Pacer & Tri-Pacer	658	
Apache	219	
TOTAL	1273	12,248
Taylorcraft—Model 20	17	170
GRAND TOTAL	3579	53,979

◆ ◆ ◆

NARCO in New Plant

National Aeronautical Corp. recently moved into its new 25,000 sq. ft. plant in Fort Washington, Pa. The new facility more than doubles Narco's old production facilities in Ambler, Pa.

→

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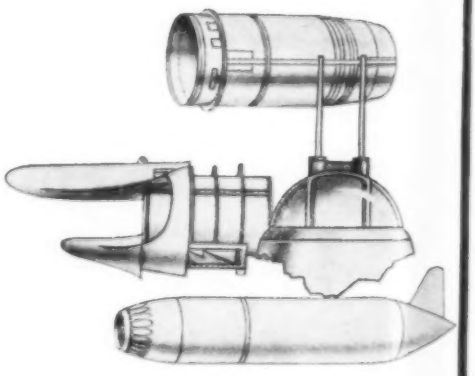

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TRANSPORT TRENDS Washington, D. C., Aug. 13, 1956

INSIDE TRACK ON THIRD CARRIER for New York-Miami route has shifted to Northeast Airlines, with tentative 3-2 CAB vote in its favor. Although final Board order is still some time away, agency has given nod to the New England line.

Delta Air Lines, which had the CAB Examiner's support, is still a contender. Board is weighing possibility of supplementing NEA award by giving Delta one-stop New York-Miami route via Atlanta.

Board majority—Chairman Durfee, Vice Chairman Adams, and Member Minetti—favored NEA for five-year trial period. In a related case, CAB also is reported to have selected Pan American World Airways for New York-Nassau nonstop.

●

AMERICAN AIRLINES REPORTEDLY is willing to accept a three-month delay in Lockheed Electra deliveries if it decides on a revolutionary cabin interior layout proposed by Lockheed and already in mockup form at Burbank. It calls for several small passenger compartments with seats arranged in irregular "living room" style.

●

THERE'S NEW COMPETITION AHEAD for airlines in the transatlantic market. Recent award of operating contract to shipowner Aristotle Onassis touched off an expansion of international operations of TAE Greek National Airlines. Number one target—Athens-to-New York service.

TAE has ordered three DC-7Cs, may inaugurate service even before their delivery, possibly with DC-6Bs. Carrier also ordered three Convair Metropolitans to supplement present fleet of 14 DC-3s and one DC-4.

●

ICE HAS BEEN BROKEN by Fairchild on executive sales of turboprop F-27 with firm order from General Tire & Rubber Co. Look for similar deals by Arthur Godfrey and Johns-Manville soon, with at least six others actively being negotiated.

Company is still pushing airline sales campaign. Representatives are currently in Alaska for presentation to Alaskan carriers.

●

DOMESTIC AIRLINE TRAFFIC SLUMPED in July. Reasons: Grand Canyon accident, steel strike, mid-week July 4 holiday, poor weather in the east. July traffic traditionally isn't as good as June, but drop was larger than normal this year. One major trunk puts the decline at about 5% below normal. Others think it was more.

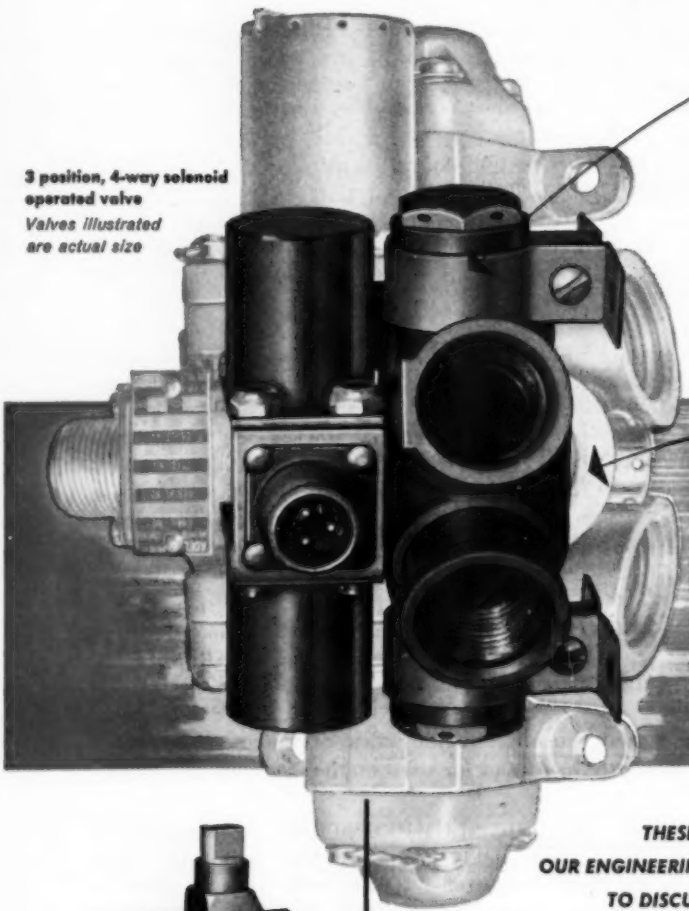
Reaction to Grand Canyon accident wasn't immediate. Continued stories of near misses, inadequate traffic control, etc., were responsible. Steel strike hit first-class travel (coach traffic remained relatively high).

●

LEGAL BATTLE BY TRANS AMERICAN AIRLINES to thwart CAB revocation of its operating rights may be headed for setback. Although court action can continue for sometime, Board's Compliance Office may upset the schedule. It now seeks immediate suspension of operating rights of individual companies in the nonsked combine.

Action is most drastic yet taken. It hinges on claim of Compliance investigators that individual nonsked members are operating in excess of authority and without blessing of the Court stay order enjoyed by the group as a combine.

Now! ADEL offers a new line of HIGH TEMPERATURE MINIATURE VALVES



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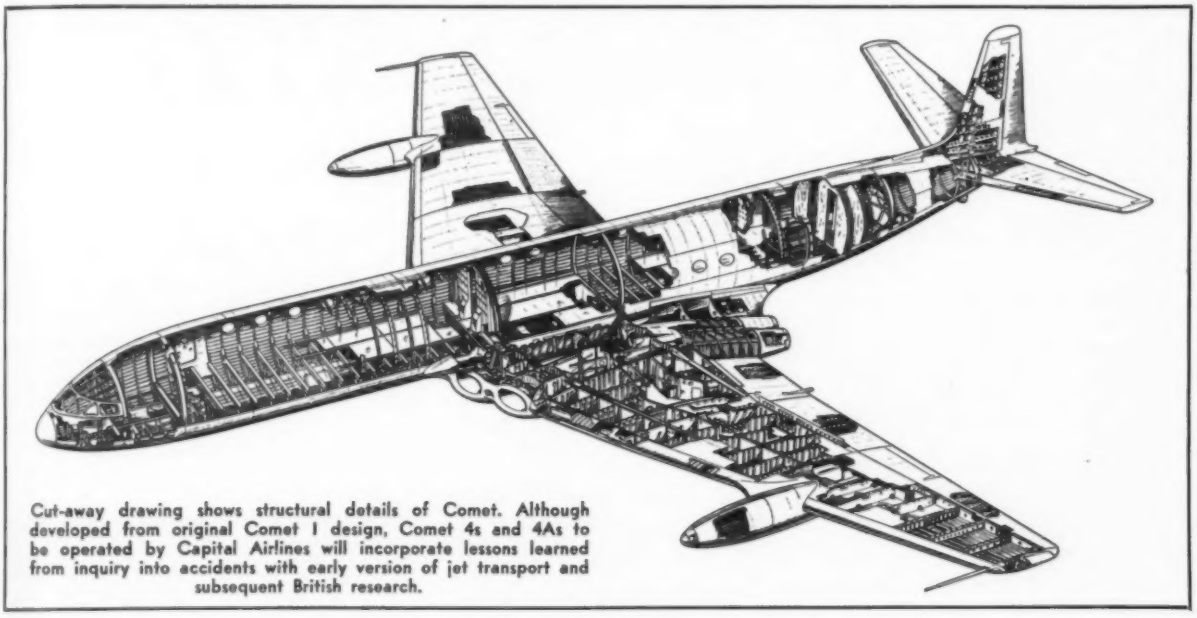
Circle No. 37 on Reader Service Card.

Carriers Take New Look: Turboprops or Jets?

Here's how Capital's purchase of 14 de Havilland Comets has affected plans of U.S. and British aircraft manufacturers



Cut-away drawing shows structural details of Comet. Although developed from original Comet I design, Comet 4s and 4As to be operated by Capital Airlines will incorporate lessons learned from inquiry into accidents with early version of jet transport and subsequent British research.

By ANTHONY VANDYK

The airline industry once again is finding it necessary to reappraise the comparative merits of the turbojet and turboprop as prime movers. Latest re-evaluation of the situation results from the unexpected comeback of the de Havilland Comet. Capital Airlines' order for 14 of the British jets has come as a blow to proponents of the turboprop transport, particularly to those companies committed to build big aircraft of this category.

The increased airline interest in medium jets is welcomed by three of the west coast's four transport manufacturers. While Convair is the only one to have sold any (40 to date) aircraft in this category, both Boeing and Douglas have scaled-down versions of their 707 and DC-8 on the drawing board aimed at this market. The Boeing and Douglas models are designated 717 and DC-9, respectively.

• **In England,** the position is reversed. Only one (de Havilland) of the three big transport aircraft manufacturers has a turbojet transport beyond the preliminary design stage. Bristol is tooled up for a big production of Britannia turboprops while Vickers, having abandoned the 1000 jet, is committed to build the Vanguard, big brother of the Viscount. There has been talk of a Vickers medium jet project but company officials have discounted these reports.

Both the Britannia and Vanguard are in far less favorable positions orderwise than Lockheed's Electra. At the moment 128 Electras have been ordered while Britannia and Vanguard contracts involve 51 and 20 aircraft, respectively. To date all but ten of the Britannia order have come from airlines. Indications are, however, that while interest in turboprops is waning among commercial operators, the military are getting more and more enthusiastic for the turboprop as the powerplant for its transports.

Britain Committed to Both

Britain is the only country committed to use both jet and turboprop transport in military service. The Royal Air Force currently has two Comet 2s for crew training and will get eight more to equip a squadron of Transport Command. Military use of the Comet 2 will be of great use to the commercial program. By the time the Comet 4A is in service early in 1959 several thousand hours of regular operation of Comet 2s should have been accumulated by the RAF.

• **The Comet 4A** was designed specially to meet Capital Airlines' requirements but it will also suit many other carriers. British European Airways is one likely customer. By increasing the Comet 4's fuselage 40 inches and clipping the wing by seven feet, the Comet 4A has been developed as an aircraft capable of carrying a maximum payload of 22,690 lbs. for stages varying between 1,880 and 2,730 miles, depending on seating configuration and cruising speed. With its rear fuselage and tail strengthened, the air craft can cruise at higher speeds at lower altitudes than earlier Comets. Optimum cruising altitude is 23,500 ft. where the maximum cruising speed will be 522 mph.

For a 1,500-mile stage the Comet 4A with tourist class seating (91 passengers) costs 1.54 cents per mile to operate. With 70 first-class passengers the figure is 2.02 cents. Both figures are based on the ATA formula. The basic price of the Comet 4A including radio is $3,388,000.

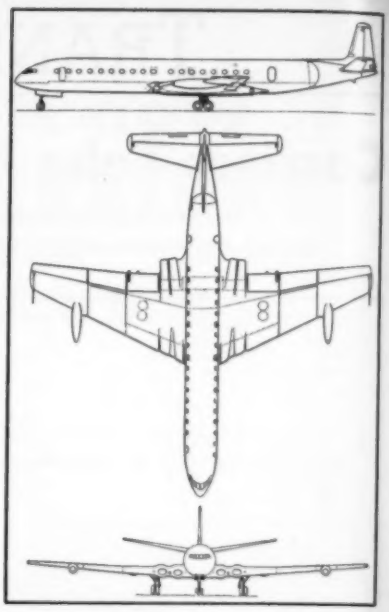
Airport performance of the Comet 4A is slightly inferior to that of the

Comet 4. It will require field length of about 6,500 ft. either for take-off at maximum gross weight (152,500 lbs.) or for landing (at 113,000 lbs. gross, the structurally-limited landing weight). These figures do not take into account the probability that reverse thrust will be available for the aircraft's Rolls-Royce Avon RA 29s. Silencers are also to be fitted to the engines.

• **The Avon RA 29** is a civil variant of the military RA 28. Two RA 29s are currently being tested in a Canberra. The Comet 3 is to be re-engined with the RA 29 and two Comet 2s will also be fitted with this powerplant. The Comet 4 and 4A will be equipped with RA 29s incorporating a Rolls-Royce/-de Havilland plan for containing the turbine disk in the event of bursting. This involves the use of a steel net, a development of the wartime oxygen-bottle guard. Turbine blade failure is not felt to be any problem since the blades cause little damage and, in any case, fly aft as well as outward.

New Tests Scheduled

Despite the unprecedented test program of earlier Comets, de Havilland is to test a complete Comet 4 airframe in the water tank at Hatfield. One of the latest of several hundreds of tests completed to date include the immersion of a 29-ft. fuselage section with specimens of every type of cut-out included. This specimen has successfully undergone 85,000 reversals of pressure in the water tank without failure.



Three-view drawing shows clipped wing (seven feet shorter than the Comet 4's) and extended fuselage (40-in. longer) of the Comet 4A. Up to 92 passengers can be accommodated.

Since de Havilland realizes that there has been some doubt expressed as to the validity of the water tank tests in assessing the fatigue life of pressurized fuselages, special tests have been conducted with box structures containing typical fuselage cut-outs mounted in the company's altitude chamber at Hatfield. In this chamber, where atmospheric pressure reversals could be carried out in conditions closely resembling reality, results tallied very closely with those obtained in the water tank.

• **As in earlier Comets,** the Redux method of bonding metal to metal is used extensively in the Comet 4 and 4A—mainly for stringers in the fuselage and in the wing.

Its use in the design of the latest Comets would have been more extensive but for the risk of overloading this section of production capacity. The problem has been eased to some extent by the recently developed process of machining skins from the solid which provides an alternative to built-up Reduxed laminae.

The design of the wing structure of the Comet 4 and 4A remains basically similar to that of the earlier versions, and the only significant change is that the naturally-aged copper-based light alloys have been used in the tension booms and bottom skin in the tension booms and bottom skin in order to improve the fatigue life. ◈◈◈

Why Capital Bought Comets

The purchase of Comets by Capital Airlines was a necessary move to ensure that the company maintains the lead it has gained in the turbine-powered aircraft field with the Viscount, according to Capital's president, J. H. Carmichael.

Carmichael asserted that with the Viscount "we have had a definite lead position on equipment." But, he added, "We know that other companies are going to try to take that lead away. As the Lockheed Electra went into service, that lead would have been gone. Electra performance will be substantially superior to the Viscount.

"We needed a plane to offset the Electra, and we needed it in advance to maintain the lead. The Comet meets our requirements for medium-range operations. We have been unsuccessful so far in getting agreement from U.S. manufacturers to build a plane for medium-range operations. The DC-8, 707 and Convair jet would be economically unsound for Capital."

Carmichael said that while U.S. jet transports may be 35 to 50 mph faster than the Comet, the latter plane has good high-speed performance at relatively low altitudes, and its elapsed time may be faster than U.S. models on Capital's stage lengths. Average stage length is 575 miles.

He added that the Comet can maneuver around airports at speeds no faster than present piston-engine planes, and can operate satisfactorily from 6000-ft. runways. All seating in Capital's Comets will be two-abreast, which Carmichael said would be a definite advantage over the 3-2 and 3-3 seating in U.S. jets.

Asked whether the company holds options on additional Comets, he said: "No, in the strict sense of the word. But we were first in the U.S. with the Viscount and we'll be the first with the Comet. So I think we will be given every consideration before anything is done that would jeopardize our position."

Capital does not anticipate buyer resistance to the Comet, Carmichael said. "That proved to be completely fallacious with the Viscount—there was no resistance to a British-made airplane. And all the difficulties of the Comet I have been completely offset by the research and test program. The Comet is the best-tested airplane in the world. Without question, we feel it's the safest airplane we could operate."

He said Capital "sees no reason to anticipate any difficulty" with U.S. certification of the Comet. Two CAA officials are going to England for an Aug. 20 preliminary board meeting. He indicated Capital has talked to CAA about the certification problem.

Capital is scheduled to receive two Comet 4s in November 1959 and two in December, with delivery of the ten Comet 4s to take place during 1959. The Comet 4s eventually will be exchanged for 4As. The first two routes on which Capital will operate Comets will be New York-Chicago and Washington-Chicago, Carmichael disclosed.

Circle No. 38 on Reader Service Card.

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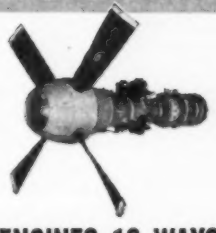
(functionally, without running the engine)

Tests RPM Accuracy to 10 RPM in 10,000 RPM (±0.1%)



T-34 Turbo-Prop Engine Pratt & Whitney Aircraft

Two of the most important factors that affect jet engine life, efficiency, and safe operation are *Exhaust Gas Temperature (EGT)* and *Engine Speed (RPM)*. Excess heat will reduce "bucket" life as much as 50% and low EGT materially reduces efficiency and thrust. Any of such conditions will make operation of the aircraft both costly and dangerous. The *JETCAL Analyzer* predetermines accuracy of the EGT and (interrelatedly) Tachometer systems and isolates errors if they exist.

The *JETCAL* is in worldwide use. Used by U. S. Navy and Air Force as well as by major aircraft and engine manufacturers. Write, wire or phone for complete information.

ANALYZES JET ENGINES 10 WAYS:

1) The JETCAL Analyzer *functionally* tests EGT thermocouple circuit of a jet aircraft or pilotless aircraft missile for error *without running the engine or disconnecting any wiring*. GUARANTEED ACCURACY is ±4°C. at engine test temperature.
2) Checks individual thermocouples "on the bench" before placement in parallel harness.
3) Checks thermocouples within the harness for continuity.
4) Checks thermocouples *and* paralleling harness for accuracy.
5) Checks resistance of the EGT circuit *without the EGT indicator*.
6) Checks insulation of the EGT circuit for shorts to ground and for shorts between leads.
7) Checks EGT Indicators (in or out of the aircraft).
8) Checks EGT system with engine removed from aircraft (in production line or overhaul shop).
9) Checks aircraft TACHOMETER system accuracy from 0 to 110% RPM with guaranteed accuracy to within ±0.1% in the operating range.
10) JETCAL Analyzer enables engine adjustment to proper relationship between engine temperature and engine RPM for maximum thrust and efficiency during engine run (Tabbing or Micing).

ALSO *functionally* checks aircraft Over-Heat Detectors and Wing Anti-Ice Systems (thermal switch and continuous wire) by using TEMPCAL Probes. Rapid heat rise . . . 3 minutes to 800°F! Fast cycling time of thermal switches . . . 4 to 5 complete cycles per minute for bench checking in production.

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B & H INSTRUMENT also makes TAKCAL TEMPCAL

Probably to be used as flag aircraft of East Germany's Lufthansa, Type 152 transport will be available for export. Production will be largely handled at Dresden, center of East Germany's revived aircraft industry.

East Germany Building Podded Jet Transport

The fast reviving aircraft industry of East Germany is planning to offer a four-jet transport to the airlines of the world, AMERICAN AVIATION has learned from an intelligence source.

Transport aircraft have been under construction in East Germany since April when production of the Ilyushin Il-14 got under way at Dresden-Klotsche. Dresden is to be the main production center of the revived East German aircraft industry.

While assembly work takes place at Dresden-Klotsche, an airfield plant, most components are manufactured in a factory located on the Konigsbruckerstrasse in the city of Dresden itself.

Performance of Type 150

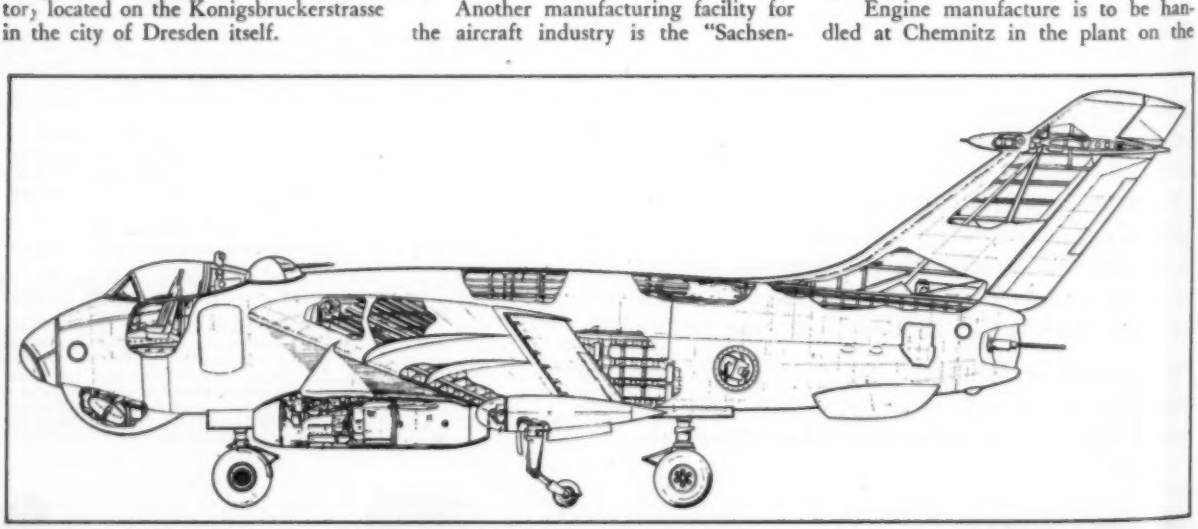
Span	82 ft.
Thrust (each engine)	11,000 lbs.
(with afterburner)	14,300 lbs.
Aspect ratio	4.8
Length of fuselage	89.2 ft.
Total length	103 ft.
Angle of sweepback	22°
Takeoff weight*	110,250 lbs.
Payload	11,025 lbs.
Weight of fuel	30,820 lbs.
Empty weight	68,355 lbs.

* Approximately.

Another manufacturing facility for the aircraft industry is the "Sachsenwerkshalle" at Niedersedlitz near Dresden. This plant is being expanded and will not be completed until 1959. At present it employs 3,000 workers but this number is scheduled to be doubled by the end of the year. Another aircraft plant is to be built at Dresden-Heide.

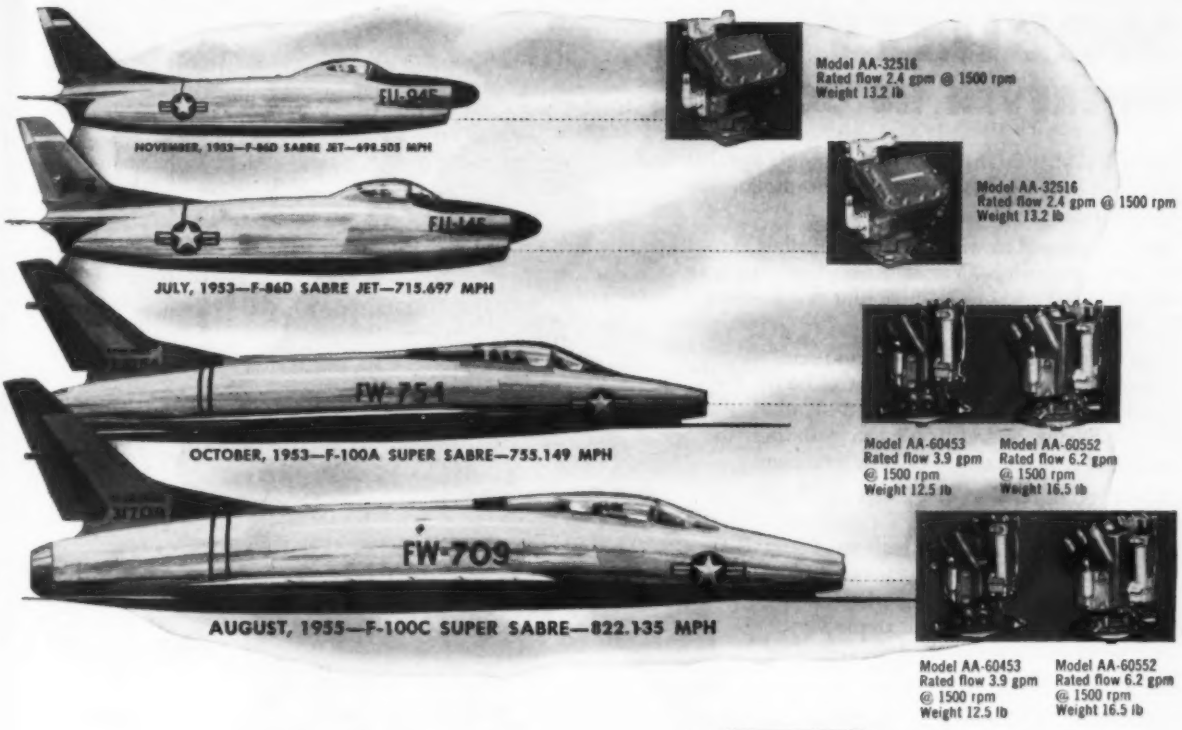
• **Components** such as wings and tail units, as well as jigs and tools for the aircraft industry, are being built at Leipzig-Schkeuditz (address of this plant is Kurt-Bergerstrasse 12). This factory, which is located at an airfield, will have a major responsibility for repairing and overhauling aircraft.

Engine manufacture is to be handled at Chemnitz in the plant on the



Designed by Professor Baade, now development chief of East Germany's aircraft industry, the Type 150 was built in Russia but never got beyond prototype stage.

WHERE *DEPENDABILITY* COUNTS MOST



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WHEREVER HE GOES

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But to fight and to win he must have mobility—in three dimensions. Vertol helicopters—such as the H-21 "Workhorse"—give him this freedom of motion, of action.

Now he can be flown into position, reinforced, or redeployed in a matter of hours. He can be supplied, rearmed and fed—and Vertol "flying ambulances" can rush him to the combat hospitals for earliest treatment.

The rugged, reliable H-21 can airlift 20 fully-equipped soldiers, or, for medical evacuation, 12 litter cases with attendant. In its cabin, more than two tons of cargo can be carried. As a "flying crane" it can ferry bulk equipment over rivers and mountains on its external cargo sling.

Performance—versatility; these are the reasons why the Armed Forces have consistently picked Vertol helicopters for the toughest jobs.

Outstanding job opportunities are available for engineers

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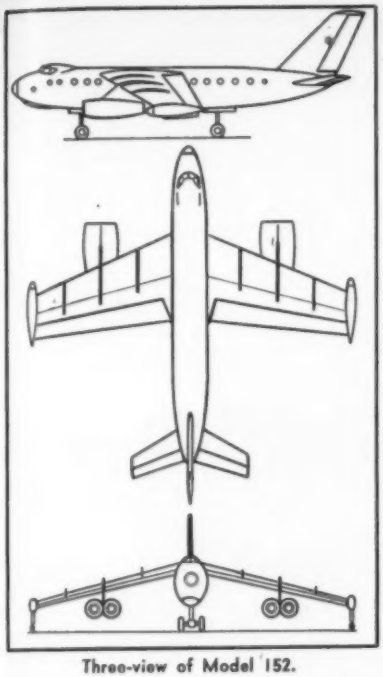


Three-view of Model 152.

Zwickauerstrasse which at one time was known as the Wanderer factory and, at another time, was owned by SAG Kabel. This facility is currently being used for the development of aircraft engines. Test stands have been built on the side of the Chemnitz-Zwickau railroad line. Another plant to be used by the German aircraft is a facility formerly known as the Second Machine Factory at Chemnitz-Siegmar. After it has been enlarged this factory will employ 9,000 workers.

It is also likely that various plants formerly belonging to Junkers in Dessau are being brought back into aircraft and engine work. The former Siebel aircraft plant at Halle also is likely to be revived.

• **Development center** for the East Germany aircraft industry is at Pirna-Sonnenstein under the direction of Professor B. C. Baade.

Professor Baade worked for several years after the war in Russia and designed the Type 150 medium tactical jet bomber, which in 1952 attained a speed of more than 620 mph at 35,000 ft. without difficulty. The Type 150 never went into production, possibly because the Russians did not want to build an aircraft of all-German design. Nonetheless, they got considerable value from the plane and have used its hydraulic system in one of their own aircraft.

The jet transport likely to be built by the East German aircraft industry is the Type 152, a derivative of the Type 150. The Type 152 differs from the Type 150 in having four engines instead of two and, of course, a transport-type fuselage. It is estimated that the performance of the transport will be very similar to that of the bomber. ◈◈◈

Why AA is Spending $500,000 Yearly On "Music-'Til-Dawn" Radio Program

By ERIC BRAMLEY

Can an airline develop travel by sponsoring an all-night radio program? And particularly if it's a program of classical and semi-classical music, in sharp contrast to the rock 'n roll usually heard at that time?

In the past three years, American Airlines has found that the answers to these questions are in the affirmative.

It recently renewed for three more years the "Music 'Til Dawn" program now heard in nine cities. The renewal with five CBS stations (others are individually negotiated) involved one of the largest blocks of spot radio time ever bought—29,133 programming hours. Cost was almost $1 million for the three years of CBS time alone.

• **The nine stations** now carrying the program are in big AA cities: WBZ, Boston; WCBS, New York; WTOP, Washington; WBBM, Chicago; WLW, Cincinnati; WWJ, Detroit; KRLD, Dallas; KNX, Los Angeles, and KCBS, San Francisco.

Strangely enough, it took a selling job by AA president C. R. Smith to get "Music 'Til Dawn" on the air in the first place. His idea that a program of good music and news would sell AA wasn't well received either in the company or at its advertising agency. Radio wasn't a good medium for the type of "soft sell" that Smith had in mind, opponents argued. And, besides, who was going to listen to an all-night program?

Smith prevailed, however, and MTD went on the air. And recent surveys indicate that about 3,339,000 families listen to the program each week. AA has received about 15,000 unsolicited fan letters, and about 7% said that the writers have flown or are planning to fly AA (numerous passengers on AA planes use the seat pocket forms to write the company, expressing thanks for the program). Students, entertainers, teachers, doctors, writers, members of the armed forces and factory workers are among the regular listeners.

MTD's hours are now 11:30 p.m. to 5:30 a.m. (starting time formerly was midnight), Monday through Saturday. In almost all cases, AA is still using the original announcers at each station. Incidentally, before MTD first went on the air in 1953, the announcers were taken on a tour of the AA system to familiarize them with the company and its operations. They still pay frequent visits to airport offices and sales offices to keep themselves informed on developments.

• **MTD is not a request show.** All programming is done by Ernest Hartman, radio-TV supervisor on AA's account at its advertising agency, Lennen & Newell (Hartman was with WCBS in 1953 and worked on putting together the first MTD show). Music ranges from Beethoven and Bach to Rodgers and Hammerstein and Victor Herbert. Hartman arranges the selections so that there's no repeat in 36 programs.

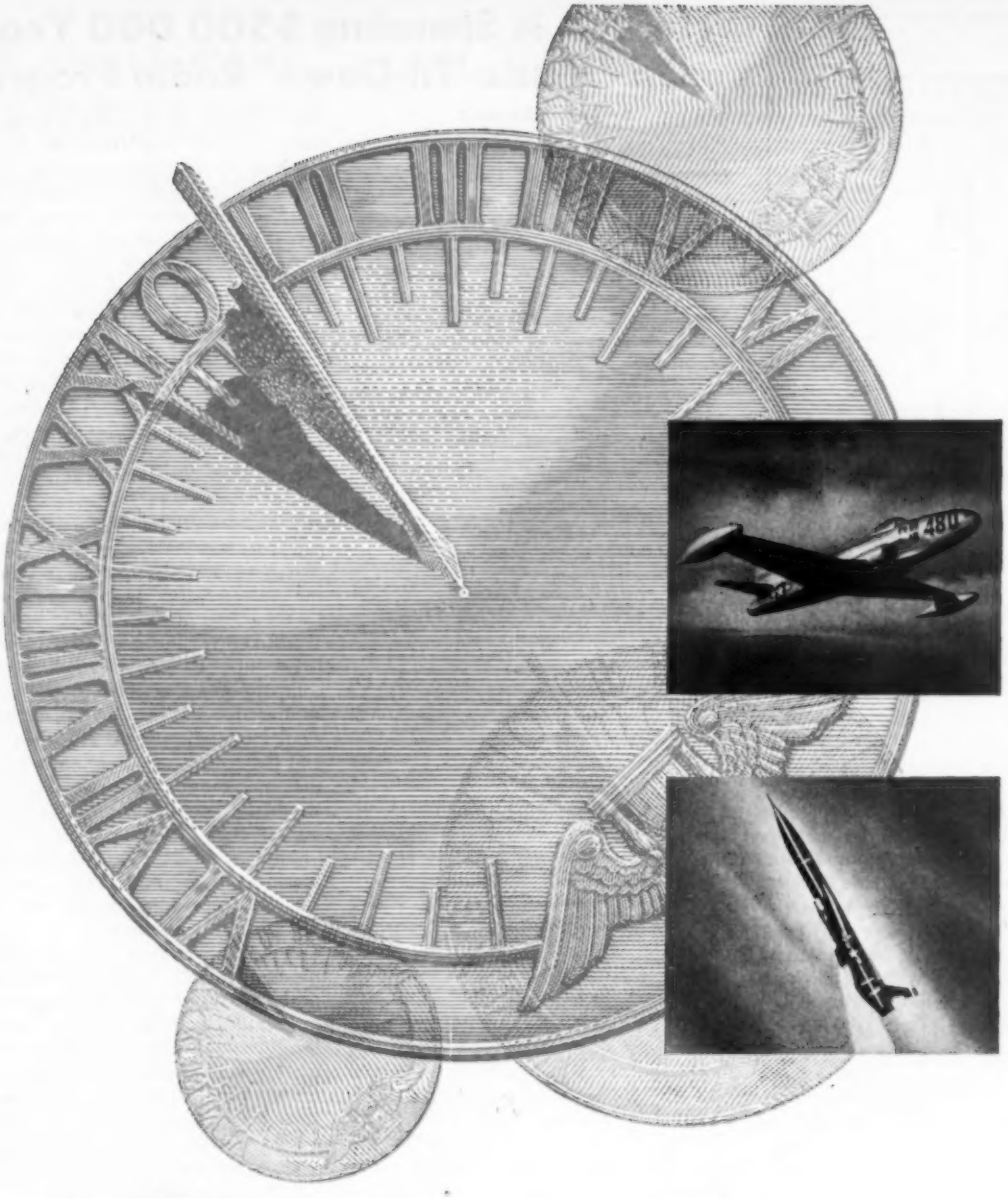
Commercials are keyed to the tone and pace of the show—"restrained and in good taste," as one AA official puts it. No telephone numbers, no repetition of price, no other "hard sell" devices. Messages are generally informative about AA's routes, equipment, cities served and services offered. Although contracts call for four commercials during the first hour and five per hour thereafter, the full number is not always used. Commercials must be under 40 seconds.

Recently, the president of another major airline was asked whether his company had ever considered a program similar to MTD. "In analyzing the available audience during these hours and the cost of the program, we decided that any radio money we might spend would be better spent in spot advertising at peak listening hours," he said. "Radio is most effective during the morning or evening news areas. These are the times when a spot will deliver the highest audience."

AA, obviously, has different thoughts on the subject. It uses spots at peak hours, but by far the biggest chunk of its radio expenditure (over half a million dollars yearly) goes for MTD. That the company would put this kind of money into an all-night show out of a total ad budget of about $5 million is good indication that it believes the program is paying off. ◈◈◈

New Configuration

BOAC will use Bristol Britannia in a mixed-class configuration when turboprop transport is introduced on London-Johannesburg and London-Sydney routes this fall. First-class compartment (shown above) accommodates 19 passengers, while forward there are seats for 42 tourist passengers.



MEETING A DECADE OF CHALLENGES

From the P-80 Shooting Star to missile star shooting, the past ten years of technological advancement presented many challenges to the Avionics industry and G. M. Giannini & Co., Inc.

Now, with a wealth of engineering experience and increased production facilities, Giannini is looking forward—with confidence—to meeting a new decade of even more exacting challenges.

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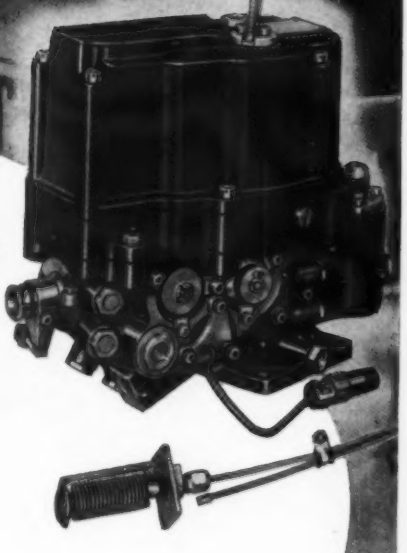
You can depend on CECO Fuel Controls and Components to insure initial high performance . . . and you can depend on Chandler-Evans Modification Service to provide the established procedures, experience, facilities and know-how it takes to insure continued high performance!



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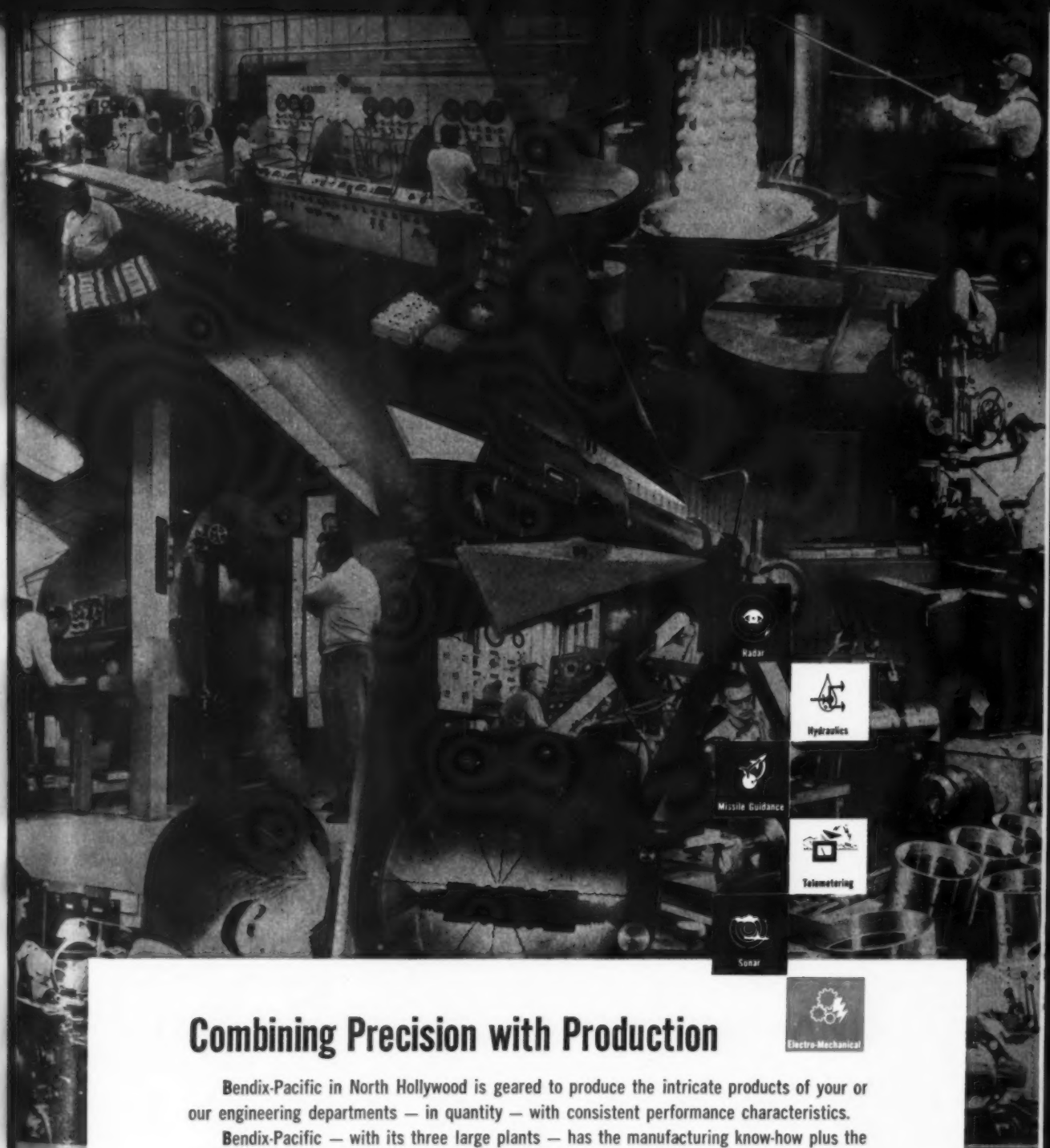

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Bendix-Pacific — with its three large plants — has the manufacturing know-how plus the capacity to meet your quality and performance requirements efficiently and economically, in any quantity desired.

Bendix-Pacific . . . Specialists in servo and hydraulic packages.

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PACIFIC DIVISION
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NORTH HOLLYWOOD, CALIF.

Bridgeport, Conn. • Dallas, Texas • Dayton, Ohio • Washington, D.C.

Manufacturers Report Earnings to SEC

Six aircraft manufacturing executives received total remuneration of $150,000 or more during 1955, and 10 officials of aircraft parts and equipment makers received $100,000 or more, according to an analysis of data filed with the Securities & Exchange Commission.

Among the 21 plane manufacturing firms studied, 21% of the officers received $100,000 or more, 17% were in the $75,000 to $100,000 bracket, 38% from $50,000 to $75,000, and 24% from $30,000 to $50,000.

• **Top four** were Roy T. Hurley, president and board chairman of Curtiss-Wright Corp., $210,155; H. M. Horner, president of United Aircraft Corp., $185,700; J. H. Kindelberger, board chairman of North American Aviation, $172,800, and Donald W. Douglas, president of Douglas Aircraft Co., $162,528.

One officer among the 17 parts and equipment manufacturers studied received over $150,000, 13% were paid $100,000 or more, 22% from $75,000 to $100,000, 19% from $50,000 to $75,000, and 46% from $30,000 to $50,000.

• **Top three** were F. C. Crawford, board chairman of Thompson Products, $155,450; M. P. Ferguson, president of Bendix Aviation Corp., $142,750; J. D. Wright, president and general manager of Thompson Products, $141,500.

Following is a breakdown of officers whose aggregate remuneration (salary, bonus and incentive awards) was $30,000 or more during 1955. Figures in parentheses show change from 1954. Stock options granted during 1955 are also listed:

MANUFACTURERS OF AIRFRAMES & ENGINES

AVCO Manufacturing Corp.—V. Emanuel, pres., and chmn. of board, $125,000, stock option for 75,000 shares common stock at $6.125; W. A. Mogensen, dir., $75,000, stock option 15,000 shares common stock at $6.125; J. D. Shouse, vp, $75,000, stock option 12,500 shares common stock at $6.125; K. R. Wilson, Jr., vp, $32,083, stock option 3,000 shares at $6.625, 8,000 shares at $6.125.

Beech Aircraft Corp.—O. A. Beech, pres., $99,036 (up $9,123); J. P. Gaty, vp and gen. mgr., $74,902 (up $5,925); F. E. Hedrick, vp, $72,495 (up $6,526); C. C. Pearson, vp, $58,531 (up $6,073).

Bell Aircraft Corp.—L. D. Bell, pres., $98,670 (up $13,641); L. P. Faneuf, vp, and gen. mgr. and treasurer, $70,608; R. P. Whitman, 1st vp, $61,953 (up $2,624).

Boeing Airplane Co.—W. M. Allen, pres., $118,350 (up $10,825); W. E. Beall, senior vp, $83,505 (up $6,265); F. P. Laudan, vp, $50,600 (up $2,545); J. E. Schaefer, vp, and gen. mgr., Wichita Division, $50,600 (up $595); E. C. Wells, vp, $67,395 (up $5,335); J. O. Yeasting, vp, $50,630 (up $5,015).

Cessna Aircraft Co.—D. L. Wallace, pres., $66,000; F. A. Boettger, vp and treas., $45,000 (up $3,000); D. L. Roskam, vp, $41,250; T. B. Salter, vp, $37,500.

Chance Vought Aircraft, Inc.—C. J. McCarthy, chmn. of board, $56,575 (up $17,105); F. O. Detweiler, pres., $67,825 (down $595), stock option for 3,000 shares at $29.25 per share; H. B. Sallada, exec. vp, $46,400 (up $1,430); N. V. Turney, vp and controller, $34,750 (up $30), stock option for 500 shares at $29.25 per share.

Continental Motors Corp.—C. J. Reese, pres., $108,246 (up $200); H. A. Todd, pres. of subsidiary, Wisconsin Motors Co., $75,830 (up $250); L. P. Kalb, technical advisor, $44,280 (down $3,050); H. W. Vandeven, treas., $66,213 (up $5,053); A. W. Wild, vp, $61,063 (up $3,027).

Curtiss-Wright Corp.—Roy T. Hurley, chmn. of board and pres., $210,155 (up $38,334), stock option for 25,000 shares at $23.875 per share; G. R. Hill, vp, $86,177 (up $2,071), stock option for 10,000 shares at $23,875 per share; E. M. Powers, vp, $47,266 (down $14,325); J. V. Miccio, vp, gen. mgr. of Wright Aeronautical Division, $56,268.

Douglas Aircraft Co., Inc.—Donald W.

(*Continued on page 95*)

Summary of U. S. Airline Traffic for May 1956 vs. May 1955

(Compiled by American Aviation Publications from Official C.A.B. Data.)

Airlines	Revenue Passengers May 1956	Revenue Passengers May 1955	% Change	Revenue Passenger Miles (In Thousands) May 1956	Revenue Passenger Miles (In Thousands) May 1955	% Change	Total Ton-Miles Rev. Traffic May 1956	Total Ton-Miles Rev. Traffic May 1955	% Change	% Available Ton-Miles Used May 1956	% Available Ton-Miles Used May 1955
DOMESTIC											
American	688,794	643,402	7.1	403,459	362,565	11.3	46,456,328	42,104,108	10.3	58.60	57.83
Braniff	154,642	144,857	6.8	60,886	53,266	14.3	6,593,390	5,688,605	15.9	54.15	55.83
Capital	252,830	225,754	12.0	86,049	70,073	22.8	8,953,605	7,479,386	19.7	45.00	42.06
Colonial	36,103	38,324	—5.8	8,637	9,520	—9.3	855,031	933,910	—8.4	45.61	49.33
Continental	59,259	55,008	7.7	21,060	19,689	7.0	2,243,465	2,095,911	7.0	46.10	47.00
Delta	201,646	181,555	11.1	92,599	80,735	14.7	10,102,254	8,768,499	15.2	55.79	62.03
Eastern	606,772	548,772	10.6	292,560	258,492	13.2	32,028,202	28,450,134	12.6	46.83	49.48
National	103,073	90,893	13.4	68,068	60,519	12.5	7,647,230	6,785,626	12.7	68.78	65.54
Northeast	48,709	46,021	5.8	9,707	9,166	5.9	938,163	885,857	5.9	56.25	55.87
Northwest	112,173	109,874	2.1	72,185	71,061	1.6	8,288,444	8,041,947	3.1	47.74	47.03
TWA	353,703	328,476	7.7	267,399	236,543	13.0	29,065,386	26,261,574	10.7	59.32	60.86
United	529,790	476,594	11.2	361,263	321,701	12.3	41,945,558	37,272,947	12.5	56.26	57.40
Western	88,299	91,364	—3.4	41,511	40,965	1.3	4,447,140	4,420,336	0.6	55.84	53.11
TOTALS	3,235,793	2,980,894	8.6	1,785,383	1,594,295	12.0	199,564,196	179,188,640	11.4	54.49	55.30
INTERNATIONAL											
American	9,893	9,984	—0.9	6,300	6,160	2.3	950,853	867,263	9.6	62.08	60.00
Braniff	2,644	3,060	—13.6	5,763	6,790	—15.1	746,119	883,608	—15.6	52.48	46.23
Colonial	5,161	4,105	25.7	4,002	3,172	26.2	434,766	348,742	24.7	66.05	75.23
Delta	4,404	3,821	15.3	5,285	4,620	14.4	596,112	541,453	10.1	46.94	38.72
Eastern	15,941	14,230	12.0	22,477	20,046	12.1	2,523,402	2,276,889	10.8	50.10	56.18
National	7,989	6,494	23.0	4,544	3,682	23.4	506,850	431,729	17.4	45.09	40.32
Northwest	11,101	7,825	41.9	19,435	15,388	26.3	3,905,922	2,986,459	30.8	66.09	60.31
Panagra	11,838	10,849	9.1	13,581	13,103	3.6	1,877,300	1,658,679	13.2	57.56	54.83
PanAmerican											
Latin Amer.	88,189	74,685	18.1	82,617	74,012	11.6	11,441,679	10,091,286	13.4	55.58	58.11
Atlantic	92,424	73,248	26.2	108,286	90,777	19.3	14,047,394	11,984,417	17.2	64.06	65.97
Pacific	22,677	17,920	26.5	69,671	57,644	20.9	9,961,585	8,375,272	18.9	68.19	65.52
Alaska	7,234	6,923	4.5	8,683	9,454	—8.2	1,373,065	1,272,141	7.9	57.41	49.92
TWA	26,918	22,595	19.1	64,991	58,573	11.0	8,440,576	7,503,337	12.5	73.80	72.18
United	7,393	5,469	35.2	18,366	13,616	34.9	2,091,145	1,601,876	30.5	60.13	66.60
TOTALS	313,806	261,208	20.1	434,001	377,037	15.1	58,896,768	50,823,151	15.9	62.23	61.99
LOCAL SERVICE											
Allegheny	36,530	30,385	20.2	6,016	4,811	25.0	603,725	479,794	25.8	45.57	48.70
Bonanza	11,535	8,675	33.0	2,455	1,879	30.7	244,002	190,444	28.1	40.77	37.97
Central	11,663	8,413	38.6	1,853	1,315	40.9	189,543	135,979	39.4	33.11	25.13
Frontier	16,266	14,867	9.4	4,258	3,867	10.1	498,437	455,717	9.4	56.62	53.55
Lake Central	12,889	10,274	25.5	1,956	1,577	24.0	189,736	154,477	22.8	37.77	33.50
Mohawk	33,483	23,332	43.5	5,984	4,152	44.1	596,951	411,999	44.9	55.97	61.18
N. Central	46,870	37,996	23.4	7,102	5,945	19.5	724,633	602,664	20.2	44.74	44.50
Ozark	27,860	22,403	24.4	4,278	3,397	25.9	429,711	334,997	28.3	39.09	38.76
Piedmont	36,262	33,446	8.4	6,839	6,374	7.3	694,953	640,889	8.4	56.05	52.80
Southern	16,399	16,061	2.1	2,902	2,701	7.4	299,854	278,468	7.7	43.84	43.77
Southwest	24,147	23,486	2.8	4,608	4,466	3.2	460,795	449,459	2.5	43.38	53.44
Trans-Texas	18,479	13,890	33.0	4,170	3,137	32.9	438,789	331,643	32.3	37.14	36.70
West Coast	19,812	19,727	0.4	3,409	3,114	9.5	319,116	294,579	8.3	50.39	46.24
TOTALS	312,195	262,955	18.7	55,830	46,735	19.5	5,690,245	4,761,109	19.5	45.65	45.50

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MANUFACTURERS' EARNINGS

(*Continued from page 92*)

Douglas, pres., $162,528 (up $3,903); F. W. Connant, sr. vp, $108,518 (up $2,702); A. E. Raymond, vp, $76,113 (up $2,022); D. W. Douglas, Jr., vp, $46,793 (up $1,477), stock option for 650 shares at $85 per share; N. Paschall, vp, $41,949 (up $1,674), stock option for 550 shares at $85 per share; F. E. Hines, vp, $38,307 (up $911), stock option for 450 shares at $85 per share.

Fairchild Engine and Airplane Corp.—R. S. Boutelle, pres., $140,816 (up $13,748), stock option for 3000 shares at $14.25 per share; A. F. Flood, exec. vp and comptroller, $110,107 (up $13,625), stock option for 2500 shares at $14.25 per share; W. L. Landers, vp, $87,355 (up $15,844), stock option for 2,000 shares at $14.25 per share.

General Dynamics Corp.—J. J. Hopkins, pres. and chmn. of board, $153,504 (up $389); F. Pace, Jr., exec. vp, $93,644 (up $34,323); E. D. Johnson, sr. vp, $44,578, stock option for 20,000 shares (Adjusted to reflect 2 for 1 stock split of March 10, 1955) at $43.82 per share; J. T. McNarney, sr. vp, $95,500 (down $5,750); J. G. Notman, pres. and gen. mgr. of Canadair, Ltd., $90,300 (up $2,300); L. B. Richardson, sr. vp, $51,826 (up $6,444); O. P. Robinson, Jr., sr. vp, $61,817 (up $12,413); R. C. Tait, sr. vp, $32,242 (Plus $31,884 paid by Stromberg-Carlson Co. in 1955 prior to its merger with and into the corporation) stock option for 10,000 shares at $56.29; L. J. Gross, vp, $56,000 (up $13,042); R. I. Harris, vp and counsel, $46,000 (up $12,792); A. D. Marshall, vp, and secretary, $41,000; J. V. Naish, exec. vp, Convair Division, $83,250 (up $12,000); R. B. Watts, vp and gen. counsel, Convair Division, $53,750.

Grumman Aircraft Engineering Corp.—L. R. Grumman, chmn. of board, $74,575 (up $12,608); L. A. Swirbul, pres., $90,825 (up $18,575); W. T. Schwendler, exec. vp, $74,575 (up $12,608); E. C. Towl, adm. vp, $45,637 (up $5,604).

Lockheed Aircraft Corp.—R. E. Gross, pres. $125,928 (down $300); C. S. Gross, exec. vp, $102,446 (up $7,475); C. A. Barker, Jr., vp and treas., $88,722 (down $525); C. Chappellet, vp, $73,488 (up $4,575); H. L. Hibbard, vp, $72,688, (up $4,000); E. R. Quesada, vp, $53,529 (up $7,759); C. B. Squier, vp, $60,102.

Martin, Glenn L.—G. M. Bunker, pres. and chmn. of the board, $150,000 (up $10,000); W. B. Bergen, exec. vp, $58,333, stock option, 4,000 shares at $28.125 per share; G. T. Willey, vp, $50,000.

McDonnell Aircraft Corp.—J. S. McDonnell, pres., $66,087 (up $1,000); R. H. Charles, exec. vp, $41,441 (up $2,668); C. W. Drake, vp, $37,366 (up $1,789); K. Perkins, vp, $32,158 (up $630).

North American Aviation, Inc.—J. L. Atwood, pres., $126,000 (up $2,000); J. H. Kindelberger, chmn. of board, $172,800 (up $2,800); R. A. Lambeth vp and treas., $62,633 (up $6,633); R. H. Rice, vp, $68,850 (up $6,050); J. S. Smithson, vp, $62,633 (up $6,633).

Northrop Aircraft, Inc.—W. C. Collins, pres., $124,583 (up $72,428); W. C. McDuffie, chmn. of the board, $49,583; R. J. Pagen, vp and treas., $60,792 (up $24,584); E. Schmued, vp, $68,042 (up $26,661); J. W. Myers, vp, $57,687 (up $21,479).

Piper Aircraft Corp.—No officer or director received aggregate remuneration in excess of $30,000.

Republic Aviation Corp.—M. I. Peale, pres., $112,024 (up $6,959); W. G. Bain, vp, gen. mgr., $78,985 (up $23,152); A. Kartvell, vp-chief engineer, $58,853 (up $5,423).

Ryan Aeronautical Co., The—T. Claude Ryan, pres., $55,000 (up $5,000); G. C. Woodard, exec. vp, $45,000 (up $5,000); L. M. Limbach, vp, $30,875.

Temco Aircraft Corp.—R. McCulloch, pres., $80,150 (up $11,850); H. L. Howard, exec. vp, $62,900 (up $6,600); C. Williams, vp and comptroller, $38,750 (up $3,750); J. A. Maxwell, Jr., vp, $38,750 (up $3,750).

United Aircraft Corp.—H. M. Horner, pres., $185,700 (down $50), stock option for 5,000 shares at $66.75 per share; F. B. Rentschler, chmn., $125,450 (down $900); L. S. Hobbs, vp, $140,000, stock option for 3000 shares at $66.75 per share; W. R. Robbins, vp and controller, $120,800 (up $9,391), stock option for 2,500 shares at $66.75 per share; W. P. Gwinn, vp-gen. mgr., Pratt and Whitney Aircraft Div., $125,580, stock option for 2,500 shares at $66.75 per share.

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Aeroquip Corp.—P. F. Hurst, pres., $79,937 (up $5,546).

(*Continued on page 96*)

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MANUFACTURERS' EARNINGS

(*Continued from page 95*)

Air Associates, Inc.—J. E. Ashman, pres., $36,500 (up $300).

Bendix Aviation Corp.—M. P. Ferguson, pres., $142,750 (up $2,400); C. Marcus, vp, $90,300 (up $1,350); R. P. Lansing, vp, $83,300 (up $1,250); W. H. Houghton, vp and treas., $78,500 (up $3,217); G. E. Stoll, vp, $75,875 (up $6,458).

Borg-Warner Corp.—R. C. Ingersoll, chmn. of board and pres., $101,000 (down $63,101), stock option granted July 1, 1955 for 2,500 shares common stock at $41.50. G. A. Shallberg, chmn. of exec. committee, $37,000 (down $7,808), stock option 1,250 shares. D. E. Gamble, chmn. of supervisory board, Borg and Beck Div., $30,900 (down $7,674), stock option 750 shares. H. G. Ingersoll, pres. of Ingersoll Steel Div., $55,900 (down $15,305), stock option 1,375 shares. R. S. Ingersoll, adm. vp, $43,700, stock option 1,075 shares. R. W. Murphy, vp and general counsel, $40,700, stock option 1,000 shares. L. G. Porter, administrative vp, $40,700, stock option 1,000 shares. E. S. Russey, pres. and gen. mgr., Warner Gear Div., $76,000, stock option, 1,875 shares. A. Steg, treas. and controller, $32,700, stock option 800 shares.

Breeze Corps., Inc., The—J. J. Mascuch, pres., $39,417 (up $8,959).

Collins Radio Co.—A. A. Collins, pres., $53,005 (up $2,384); W. J. Barkley, vice president, $37,705 (down $12,445); R. S. Gates, vp $50,305 (up $2,275); L. M. Craft, vp, $44,755 (up $2,067).

Edison, Thomas A., Inc.—C. Edison, chmn. of board, $70,000 (up $10,000); H. G. Riter, III, pres., $80,000 (up $30,000), stock option for 5,000 shares Class B common stock at $22; G. E. Stringfellow, vp $47,000 (up $12,038), stock option for 1,500 shares Class B common stock at $22; W. Hildebrand, vp, $31,500, stock option for 1,000 shares Class B common stock at $22.

Garrett Corp., The—J. C. Garrett, pres., $72,851 (up $824); M. S. Gelber, vp and secy., $33,323 (up $122); F. W. Miles, vp, $35,945 (up $2,851); W. D. Morgan, vp, $47,739 (up $419); W. R. Ramsaur, vp, $49,778 (up $377); B. N. Snow, vp, $30,781 (up $771); W. C. Whitehead, vp, $59,205 (up $600).

Greer Hydraulics, Inc.—E. M. Greer, pres., $38,550 (up $550); R. P. Lord, executive vp and treasurer, $38,550 (up $550).

Hoffman Electronics Corp.—H. L. Hoffman, pres., $30,000 (down $20,000); C. E. Underwood, vp and treas., $50,500 (down $2,000).

Jack and Heintz, Inc.—F. R. Kohnstamm, pres., $84,500 (up $9,800); E. C. Sulzman, vp, $32,775.

Kawneer Co.—L. J. Plym, pres., $100,000 (up $22,500); H. W. Zimmer, exec. vp, $85,000 (up $18,750); I. R. Seely, administrative vp, $65,000 (up $18,000).

Kidde, Walter, and Co., Inc.—J. P. Kidde, pres., $40,000; P. W. Eberhardt, vp, $34,500 (down $3,136), stock option granted March 10, 1955 for 500 shares at $21.25625 per share; V. J. Hill, Jr., vp, $34,500 (down $3,136), stock option for 500 shares at $21.25625 per share; D. Mapes, vp, $33,000 (down $1,379), stock option for 500 shares at $21.25625 per share; W. H. Freygang, president of certain subsidiaries, $35,000 (up $1,042), stock option for 500 shares at $21.25625 per share.

Minneapolis-Honeywell Regulator Co.—H. W. Sweatt, chmn. of the board, $125,000; C. B. Sweatt, vice chmn. of the board, $77,500; P. B. Wishart, pres., $100,000 (up $10,000); T. McDonald, executive vp, $77,500 (up $7,500); A. M. Wilson, exec. vp, $77,500 (up $12,500); J. J. Wilson, pres., Doelcam Div., $40,000; C. C. Buckland, vp, $34,500.

Rheem Manufacturing Co.—R. S. Rheem, pres., $120,290 (up $229); D. L. Rheem, exec. vp, $120,290 (up $229); W. E. Zander, senior vp, $51,520 (up $78); G. M. Greenwood, vp, secy. and treas., $51,520 (up $7,498); C. V. Coons, vp, $44,106 (up $84); W. S. Rheem, II, gen. mgr. and vp, $35,959; A. L. Walker, vp, $38,896; A. C. Wedemeyer, vp, $75,654.

Rohr Aircraft Corp.—F. H. Rohr, pres. and gen. mgr., $84,455 (down $545); J. E. Rheim, exec. vp, and asst. secy., $59,617 (down $383); B. F. Raynes, vp, $31,700 (down $700).

Smith Corp., A. O.—R. F. Bell, chmn. of board, $112,750 (up $7,500); A. von Wening, dir., $49,783 (down $12,467); L. B. Smith, pres., $45,200 (up $2,950); M. J. Vollmer, vp, $50,200 (down $50); F. S. Cornell, vp, $60,417 (up $4,584).

Thompson Products—F. C. Crawford, chmn. of board, $155,450 (down $4,350); J. D. Wright, pres. and gen. mgr., $141,500 (down $4,600); L. M. Clegg, vp, $60,700 (down $12,400); A. T. Colwell, vp, $85,200 (down $2,900); J. H. Coolidge, $85,300 (down $2,900).

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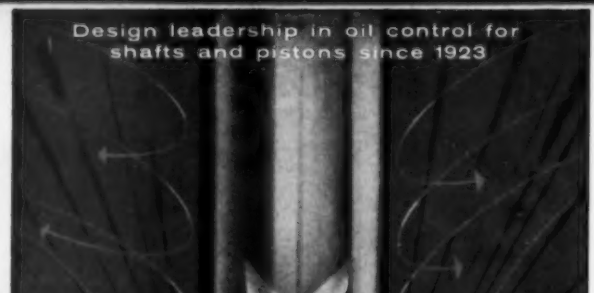

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Airline Commentary

By Eric Bramley

Just to keep the record straight, time limits on ticket pick-ups become effective Sept. 16. A penalty system on no-shows and late cancelations does *not* go into effect at that time, contrary to some stories that were written on the subject. As a matter of fact, it's not at all certain that there'll be a penalty system.

Some carriers think time limits will ease the no-show and late cancelation problem and that penalties won't be needed. And it's no secret that there's still opposition to penalties (75% of Air Traffic Conference members must vote for the system at a December meeting to make it effective). There's even some opposition to time limits on grounds that more people will have to be hired and expenses will go up. Be that as it may, time limits in September, penalty system next year—maybe.

* * *

There's a little-publicized Air Transport Association committee whose purpose is to try to make life a little easier for passengers at airport terminals. With today's crowded conditions, this aim is very commendable. The group, composed of operations personnel of several airlines and known as the Airport Passenger Terminal Service Committee, has now drawn up a list of the problems it believes must be tackled immediately.

Here are the first five, in order of importance: terminal seating space as related to number of passengers; passenger concourse design; public transportation to and from airports; escalator and stairway widths; parking and handling of automobile traffic at airports. When they solve these, we can find them plenty more.

* * *

Odds and ends: A trunkline says that 6.5 passengers out of every 1,000 carried have their bags mishandled. Last year's figure was 4.8 . . . Jim Humphrey, Lake Central's personable public relations director, recently completed a trip to Russia. He's writing a series of interesting stories for newspapers along LCA's routes and making speeches to civic groups . . . Donald J. Russell, president of Southern Pacific predicts that, because of the airplane, the Pullman car will be extinct within 20 years and that there will be little or no long-distance passenger rail travel . . . Another railroad note: despite those high prices, dining cars are still a losing proposition. In 1955, for every $1 of diner revenue, expenses were anywhere from $1.04 to $1.83, and this includes nothing for transporting dining cars or general overhead . . .

Sales, Traffic, Promotion

Western Air Lines has been using a series of fully-animated 20-second television spots with a "relaxed bird" theme to promote its champagne flights. Same theme is being used in newspaper ads. One ad, for example, shows a bird relaxing on a pillow on the tail of a WAL plane. Copy line is: "Western Airlines . . . the o-n-l-y way to fly!" Art Kelly, WAL's v.p.-sales, says the TV campaign is the most successful the company has ever had . . .

Delta Air Lines' new promotion is a record of eight different songs and dances of the West Indies, featuring six top Caribbean orchestras. Cards in seat pockets of Delta planes advertise the record, which is available from Monogram Records, 1650 Broadway, New York, for $3. Especially recorded for Delta. Good music . . .

Eastern Air Lines is selling to passengers a $2 plastic model of its Super-C Constellation. It's advertised by means of an envelope in the flight pack. Jacksonville Metal and Plastics Co., the manufacturer, reports 6,000 sold in first three months.

New **United Air Lines** eight-page booklet plugs use of air travel prizes in employe incentive programs . . . RCA Communications Inc., 66 Broad St., New York, has issued a 54-page "Handbook for the International Traveler," available at 20¢ per copy. Covers consulates, currency, automobiles, customs regulations, etc. . . . **Ethopian Airlines** has a seven-page fact sheet entitled "Travel Information for Tourists to Ethiopia." Contains information on climate, food and water, language, entry requirements, etc. Available from St. Georges & Keyes, 250 Park Ave., New York . . .

Mohawk Airlines is modifying the Convairs purchased from Swissair to increase seating from 40 to 46. Additional row of four seats is being installed in the forward part of the cabin. Lounge is being added in the rear which Mohawk says will seat two adults and one child . . . Southwest Airways is putting stewardesses on its Martin 202 equipment . . .

Travel agents who call **Swissair's** New York reservations department when all the lines are busy are now handled by a Bell automatic answering system. A recorded message informs the caller that reservations are busy and invites him to leave his name and number so the call can be returned. Caller's voice is then transcribed on tape, ready to be played back . . .

A survey of the gals who read *Charm* magazine showed that 42% schedule vacations off season and that 28% were interested in the time payment plan. Therefore, a European tour for the working girls has been packaged for this fall by **TWA,** the magazine, and **Exprinter Travel Service.** Provides for independent travel of 28 days (London, Paris, Rome, Madrid and side trips) for $1,027, based on tourist fare . . .

Machinery and machine parts topped all other types of air freight in tonnage carried by **United Air Lines** in first half of 1956. Cut flowers ranked second . . . **Slick Airways** is making available a world-wide cargo routing guide for shippers in and out of San Francisco, Oakland, Los Angeles and San Diego

Maximum size container that can be shipped via air freight has been used by United Air Lines as part of its "Cargorama" exhibit. The box, measuring 12 by 5 by 6½ ft. by one inch thick, was furnished by Gaylord Container Corp. Doors were cut in ends and it was used as an entrance for visitors inspecting the DC-6A cargoliner. Cargorama, developed by UAL to introduce the DC-6A and to spotlight features of the company's air freight operations, has been shown to shippers, manufacturers, etc., in major UAL cities.

THE BULLETIN BOARD

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AVIATION JOBS—Names and addresses of companies to contact, $1.00. Fitzgerald (Chicago Division), Dept. A-30, 815 Countryside Drive, Wheaton, Illinois.

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Books

Time - Saving Network Calculations *by H. Stockman. Second Edition. SER Co., Waltham, Mass. 120 pp. Price, $1.75.*

This second edition furnishes a set of general rules for average network problems. It attempts to indicate some possible roads away from elaborate computation methods, towards what the author calls "more elegant" methods. This "elegance" stems from use of logical and practical rules properly applied.

The use of the Potentiometer Method is emphasized as a time-saver but not a "cure-all". The author believes it applies particularly to two- and three-mesh circuits, and that the method deserves greater attention from electronics engineers.

The earlier edition was issued in abridged form by the Library of Congress.—H. P. S.

Soviet Air Power. By Richard E. Stockwell. *Published by Pageant Press, Inc., New York City. $7.50. 238 pp., plus photographs and a supplementary collection of data sheets.*

A great deal of careful work has gone into the compilation of this volume and its supplement, giving detailed data on all the various military and commercial types, is well worth a place in every aviation enthusiast's reference library.

A considerable amount of new information seems to have been acquired by Stockwell in compiling his book but much of the data is of necessity speculative. Nonetheless, "Soviet Airpower" as a whole is an excellent job and deserves wide readership.

The book summarizes most of the knowledge that was available on Soviet airpower in the west until early this year. It is unfortunate that the book went to press before the Tupolev Tu-104 jet transport's existence became known. There is no reference to this aircraft in the work and, obviously, the fact that the Russians are able to produce a transport of this type substantially changes the whole airpower picture. Nonetheless, the book is of great value to a student of the Soviet Air Force and civil aviation in Russia . . .
A. V.

Solid Propellant Rockets. *By Alfred J. Zaehringer. Published by the American Rocket Company, Box 1112, Wyandotte, Mich. 166 pp. Price, $4.*

A general introduction to the field of solid-propellant rockets, this book is written for the engineer who is entering the rocket field. The author has presented a comprehensive review of solid rocket propellants to date, covering the most essential unclassified information. A section on Soviet solid rocket trends is especially interesting. Profusely illustrated, the book contains valuable charts and performance efficiency graphs. —E. B.

Facilities

Eastern Division of Servomechanisms Inc. leased 17,000 sq. ft. in a Garden City, L. I., office building to accommodate engineering and laboratories, customer service, accounting and contracts departments until completion of new facilities for the entire division in about two years.

Airsupply Division of Garrett Corp. opened a branch office in Room 305, First National Bank Bldg., 3311 S. Broadway, Englewood, Colo.

On Mark Engineering Co., Glendale, Calif., established a new division to produce flexible and quick-connecting aircraft couplings.

Aerojet-General Corp. formed a new subsidiary, Aerojet-General Nucleonics, to engage in development and production of nuclear reactors. Offices will be at Walnut Creek, Calif.

Bell Aircraft Corp. formed a wholly-owned subsidiary, Bell Automation Corp., which will specialize in automatic controls and systems. Offices are at 749 Monroe Ave., Rochester, N.Y.

United Aircraft Corp. in the past 10 years has invested $212,900,000 of its own money in new production and experimental facilities in Connecticut. Floor space occupied by the company's three divisions has almost tripled in 10 years and totaled 10,200,000 sq. ft. on June 30. Another 568,000 sq. ft. are to be added.

Hupp Corp., Cleveland, formed Hupp Aviation Division to consolidate its aviation engineering, development and sales activities on a company-wide basis.

Lockheed Aircraft Corp. will build a one-story 68,000-sq. ft. building next to its factory at 14th and S Streets, Bakersfield, Calif. Subassembly work on the turboprop Electra transport will be assigned to the Bakersfield unit.

Filtron Co. has built a new 14,000-sq. ft. plant at 4625 Leahy St., Culver City, Calif., for manufacture of radio frequency interference filters, capacitors, pulse-forming networks and delay lines.

HERE'S A TOUGH PROBLEM OF ACCESSIBILITY

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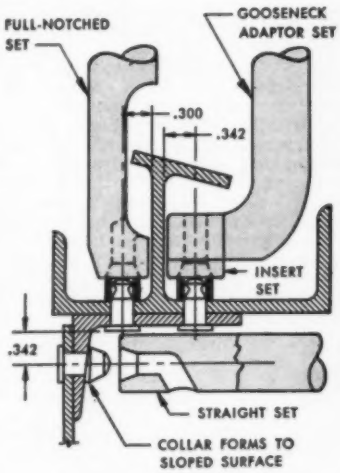

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Homeward Bound and Happy

My visit to MALEV, the Hungarian airline, was the first of two such occasions in Budapest.

Mrs. Lazlo took me to the commercial manager's office where Mr. Zamek was very cordial and we discussed aviation with Mrs. Lazlo serving as interpreter. Both assured me that Americans are welcome in Hungary and I was invited to fly over the MALEV network. I asked Mr. Zamek if MALEV intended to join IATA and he said this was under consideration but added that MALEV receives much IATA material from CSA and LOT, two satellite country members, and was adopting all standard practices.

Then a woman brought in a big tray of perfectly delicious cakes and pastries, lots of coffee, and apricot liqueur for which Hungary has always been famous. It was a bottoms up affair and Mr. Zamek insisted that one was not enough. After the third I eased off; that liqueur in the middle of the afternoon can be dynamite. I'm assured that it's always served to guests in all offices no matter what time of day. It marks red carpet treatment.

Next afternoon I paid a formal call on IBUCZ, the official Hungarian tourist agency. Unlike the USSR Intourist, it owns no cars, buses, or hotels and for this reason it prefers tourists in groups since it has to contract for facilities. I was warmly received and was served coffee followed by apricot brandy. Business visits can be rugged in Hungary.

Prices of all consumer goods in Budapest were very high. Hungary had been a rich agricultural country but the Commies decided to make it industrial. The result has been a depleted agriculture and a botched up effort at industry. It was December and I heard reports of hunger.

I found a shop selling new ceramics and chinaware and picked out a pretty good figurine for my collection. I think it was made in East Germany. When I went to pay my bill the young girl cashier looked at me and said "Ruskie?" "Hell no," I said with considerable emphasis, "American." Col. Dallam told me there have been so few foreigners in Hungary that the people (who are Magyars and hate the Slavic Russians) assume everybody who's dressed differently must be Russian.

I had gotten a single ticket for Strauss' "Der Rosenkavalier" playing at the four-tiered opera house and took a taxi from my hotel for the 7:05 performance. I had a good seat and enjoyed the performance even though it lasted for three hours and fifty minutes. But the stage settings were tawdry and the opera house shabby and most of the people were poorly dressed. It was late when the curtain rang down and I wondered how I'd get back to my hotel.

There were few cars and fewer taxis. After a long wait I was able to flag down a tiny Czech-made taxi driven by a shabbily-dressed woman. I got in and said "Grand Hotel." By her responses I concluded there must be a lot of Grand Hotels. She drove down to a main square and stopped in front of a tall, trim uniformed policeman, who likewise spoke no English. I was getting nowhere at all explaining to him when up stepped an elderly gent who asked if I spoke German. When I said no he recognized the English and asked if I were English or American. When I said the latter he beamed and asked if he could help.

In due course we got it all straightened out which Grand Hotel I wanted and he gave instructions to the old woman. I gave him a few cigarets. Meantime the trim officer maintained a stony, unfriendly stare and said nothing. (The police state in Hungary has been vicious). I got to my hotel okay and gave the old gal several chocolate bars which made me a hero pronto.

I had not yet had anything to eat so I went to the dining room to find a lot of dinner parties in progress. The head waiter who spoke some English put me at a table smack in the middle of the whole scene. Then I discovered that the flag of every single Communist country in the world was on one table or another. If I hadn't been so conspicuously alone and centered I would have asked for an American flag for my table to see what would happen. The whole place was crawling with Commies from everywhere in the world eating and drinking and so far as I knew I was the only westerner about. For no reason at all I asked the head waiter if he had Hungarian goulash. He did. I had some. I've had better but it wasn't too bad. After all, I was in Hungary.

Col. Dallam was very helpful. I have a high regard for our air attachés around the world. And the U.S. Minister, Christian M. Ravndal, one of America's best, gave me a fascinating briefing on the situation in Hungary.

I was to leave on a MALEV 14-passenger Li-2 late Saturday morning. Col. Dallam took me to the airport (no parking problem) and Mrs. Lazlo was there to give me a farewell gift of a MALEV cigaret box. After a lot of red tape in customs, I boarded my plane along with a strange group of passengers heading for Prague, Warsaw and East Berlin. The baggage was placed in the wide aisle since the fuselage is really a DC-3 type. No seat belt, no "no smoking" sign. I had a rear seat. It was Dec. 10 and the sky was dark.

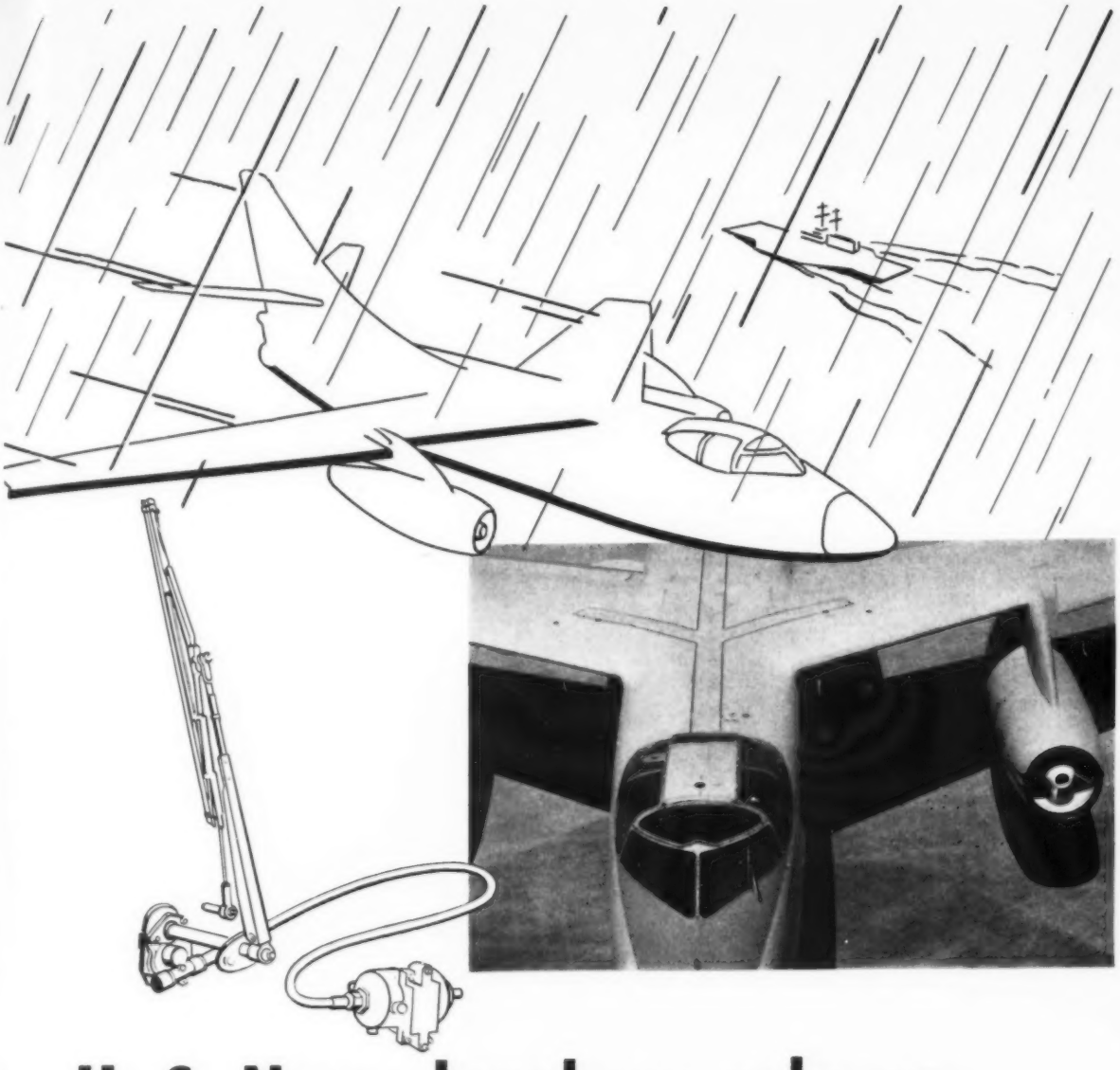
At noon a crew member came back and handed each passenger a brown paper sack, each containing one roll with two slices of salami, another roll with a slice of cheese, and one solitary chocolate. That's all. That was lunch. We flew through a snow storm, which made me uneasy, but we reached Prague okay and landed full-throttle on a fine long runway. All manner of airplanes from Communist countries were parked on the ramp but I saw one sight that made me feel very good. It was a Sabena DC-4, which was to take me back across the Iron Curtain.

Prague is not only a junction point for traffic among the Communist countries, but it's also a major point connecting the east with the west. The transit hall was crowded with people going goodness knows where. But my mind was on going west. I made doubly sure the right tags were on my baggage when it was transferred. I had a wait of about three hours.

The Sabena call finally came. We took off about 45 minutes late and I knew we had about 100 miles to fly before we reached the German border. I kept looking at my watch until I was sure we were in the west and then I relaxed. The lights of German and then Belgian cities looked awfully good. So did bright Brussels. How wonderful it was to walk down the steps to free western soil and be met by a friend, Jules Baus, of Sabena, and go to the fine Palace Hotel for a fine bath and then out to a good dinner amidst gay lights and happy people enjoying a precious freedom which all of us take so much for granted so casually.

I wouldn't take anything for the Iron Curtain experience. I had been a pioneer of sorts. But it was so terribly good—more than words can describe—to be back in fresh air.

The camera snapped at the very moment WWP set his feet on western soil on arrival from the other side of the Iron Curtain on Sabena at Melsbroek Airport in Brussels. Note his look of relief as he's being welcomed by Jules Baus, Sabena's acting director of public relations.



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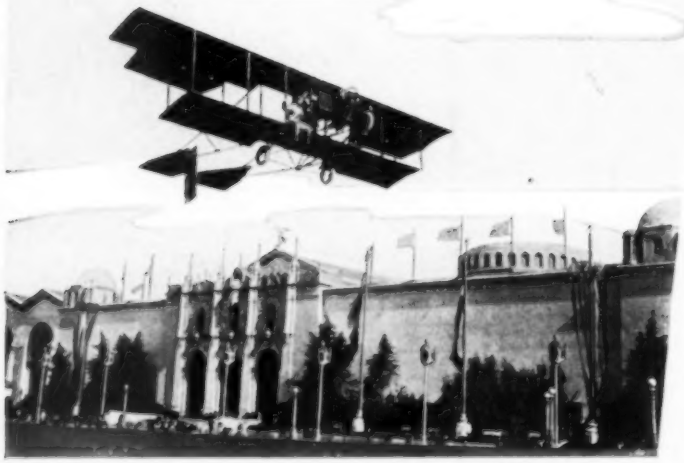
Bird Boy Art Smith

Whenever daring exploits of pioneer aviators are chronicled, the name of Bird Boy Art Smith is sure to appear. From the time he flew his first Curtiss-type biplane in 1911 until his death in 1926, Art Smith dedicated his life to aviation.

The romance of his life was heightened by the unselfish encouragement of his mother and father, who mortgaged their home so that their son could have the money to build his first airplane. Another inspiration of his early years was his sweetheart, Aimee Cour. They eloped in 1912 in what is considered to be the world's first airplane elopement.

Flying in such places as Deadwood, S. Dakota, and in the capital of Japan, Art Smith set the world record for looping the loop, pioneered sky writing and invented dozens of breath-taking stunts to win acclaim of millions throughout the world.

The custom of showing admiration for Art Smith's flying by giving him a medal started with a flight he made in the Black Hills in 1912. One of his most prized awards was a gold nugget, given him by his hero, Buffalo Bill.



Photos Courtesy Smithsonian Institution, National Air Museum

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